Total Maximum Daily Loads for Organics and Metals in the Anacostia River Watershed

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To

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This document is a total maximum daily load (TMDL) report submitted by the District of Columbia, Washington D.C. It addresses organochlorine pesticides (i.e., chlordane, dichlorodiphenyltrichloroethane (DDT) and its metabolites, dieldrin, heptachlor epoxide), polycyclic aromatic hydrocarbons (PAHs), and metals (arsenic) impairments in the Anacostia River, its tributaries, and Kingman Lake.

The document was prepared by the District Department of Energy and Environment (DOEE) with technical support from Tetra Tech and the U.S. Environmental Protection Agency (EPA).

DOEE would like to acknowledge Tetra Tech's technical support, which included collecting additional water quality data for toxic pollutants, collating and using other available data, developing the Anacostia Toxics Model, and calculating TMDLs for toxic pollutants. This effort is discussed further in the Anacostia River Toxic Constituents TMDL Modeling Report (Tetra Tech, 2023b).

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EXECUTIVE SUMMARY

This document, upon approval by the U.S. Environmental Protection Agency (EPA), establishes total maximum daily loads (TMDLs) for one metal- arsenic; four organochlorine pesticides- chlordane, dieldrin, heptachlor epoxide, and dichlorodiphenyltrichloroethane (DDT) and its metabolites; and two polycyclic aromatic hydrocarbon (PAH) groups- PAH 2 and PAH 3 (hereafter, referred to as the seven toxic pollutants) for all 13 impaired waterbody segments in the Anacostia River watershed in the District of Columbia. This results in a total of 48 TMDLs established for impaired waterbody-pollutant combinations. The remaining 72 waterbody-pollutant combinations are provided informational TMDLs[1] in Appendix A as these waterbody-pollutant combinations are not listed as impaired on DOEE's 2022 Integrated Report. Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations direct each state or jurisdiction to identify and list waters, known as water quality limited segments (WQLS), in which current required controls of a specified substance are inadequate to achieve water quality standards (WQS). For each WQLS, the state or jurisdiction is required to either establish a TMDL for the specified substance that the waterbody can receive without violating WQS or demonstrate that WQS are being met (40 C.F.R. § 130.7). Section 303(d)(3) also allows states to develop informational TMDLs where a waterbody is not identified as a WQLS.

The District of Columbia (District) has listed, in two defined segments, all of the tidal Anacostia River mainstem within the District's boundaries as impaired for the seven toxic pollutants. In addition, the District has listed nine tributaries to the Anacostia River and Kingman Lake as impaired for some of the seven toxic pollutants. These WQLS are designated for the Class C (protection and propagation or fish, shellfish, and wildlife) and Class D (protection of human health related to consumption of fish and shellfish) beneficial uses, which are currently not supported due to elevated levels of toxic pollutants, and were initially listed on the District's 303(d) list in 1998. Toxic pollutant TMDLs were established for the Anacostia River and its tributaries (DOH, 2003a) and Kingman Lake (DOH, 2003b) by the District in 2003. The TMDLs established in this report will, when approved by EPA, supersede both the 2003 Organic and Metals TMDLs for the Anacostia River and its tributaries and the 2003 Organics and Metals TMDLs for Kingman Lake.

The objective of the toxic pollutant TMDLs established in this document is to ensure that the "protection and propagation of aquatic life" and "fish consumption" uses are protected in each of the impaired waterbodies. This objective was accomplished by identifying maximum allowable toxic pollutant loads that would meet the applicable water quality criteria (WQC) through:

- The identification of toxic pollutant sources and loads using existing data and literature, which were used to estimate baseline conditions;
- The configuration and calibration of a linked watershed/receiving water model;
- The selection of a representative TMDL endpoint protective of water quality standards for each of the seven toxic pollutants from the District's applicable WQC;
- The execution of the linked watershed/receiving water model to assess the impact of flow/rainfall conditions and the major source categories on toxic pollutant loads, an iterative series of model

[1] Section 303(d)(3) of the CWA and 40 C.F.R. 130.7(e) authorize States to develop informational TMDLs as resources allow when water quality standards are currently being met. 33 U.S.C. 1313(d)(3). The intent is to develop information and identify levels that will protect the waterbody.

runs with adjustments to input loads until a set of loads (the TMDL scenario) that met the TMDL endpoints in all model segments was achieved, the calculation of TMDLs (Table E-1) and annual allocations, and an analysis to determine the impact of natural attenuation on toxic pollutant loads;

- An analysis of the impact of future climatic conditions (precipitation quantity and intensity, air temperature, and sea level rise) as a result of climate change on the loads of toxic pollutants to the system and the impact to the estimated timeframes until TMDL endpoints would be attained; and,
- The application of conservative assumptions to the TMDL scenario methods to provide an implicit margin of safety (MOS).

Table E-1 Anacostia River TMDLs

Pollutant	WLA (g/day)	LA (g/day)	Upstream Load (g/day)	Cumulative[2] TMDL (g/day)
Arsenic	2122.91	51.31	5740.27	7914.48
Chlordane	7.22	0.12	20.34	27.67
DDT	0.37	0.02	1.01	1.40
Dieldrin	0.004	0	0.01	0.014
Heptachlor epoxide	0.98	0.02	2.67	3.67
PAH 2	1.12	0.01	3.13	4.25
PAH 3	0.12	0	0.32	0.44

[1]The MOS is implicit.

[2]Cumulative daily load allocations from the downstream most segment of the Anacostia River (Anacostia #1).

EPA's regulations require TMDLs to account for seasonality and critical conditions related to stream flow, loading, and water quality parameters (40 C.F.R. § 130.7(c)(1)). Seasonality and critical conditions were considered in these TMDLs through the use of a dynamic model and analysis of all flow conditions (i.e., under both low flow and high flow scenarios) in the watershed over a 4-year simulation period. The linkage of the tidal Anacostia River to a dynamic watershed loading model ensures that nonpoint and stormwater point source loads from the watershed delivered at times other than the critical period were also considered in the analysis. Critical conditions for toxic parameter loads were incorporated by determining wasteload allocations (WLAs) based on maximum flows from dischargers set by design flows specified in nonstormwater National Pollutant Discharge Elimination System (NPDES) permits for each facility. Model simulation of multiple complete years accounted for seasonal variations. Continuous simulation (modeling over a period of several years that captured precipitation extremes) inherently considers seasonal hydrologic and source loading variability.

Progress toward achieving the Anacostia River toxic pollutant TMDLs described in this report will require substantial reductions of toxic pollutants from point and nonpoint sources to the watershed. The District intends to proceed with an adaptive implementation approach concurrent with activities (e.g., on-going monitoring and best management practices (BMPs)) to reduce toxic pollutant loadings. Toxic pollutant regulatory activities will include the incorporation of WLAs in NPDES permits after the TMDL has been approved. In the District, several monitoring, restoration, and regulatory programs are already in place that are and will continue to reduce toxic pollutant loads from both point and nonpoint sources. These programs include storm water runoff controls, erosion control measures to reduce sediments and nutrients, identification of additional toxic pollutant sources and contaminated sites, and remediation of contaminated sites. While not part of the TMDL scenario, instream remediation efforts, such as dredging and capping river bottom sediment in certain toxic pollutant hotspots, may be undertaken in connection with the Anacostia River Sediment Project (ARSP) to address PCB (and coincident pollutant) contamination. No aspect of these TMDLs is inconsistent with these remediation efforts, and in fact, it is anticipated that instream remediation efforts will aid implementation of these TMDLs and decrease the amount of time it takes for water quality to approach the TMDL endpoints. Follow-up monitoring of water, sediment, and fish tissue will be conducted as a component of the District's implementation strategy.

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ABBREVIATIONS

ARSP	Anacostia River Sediment Project
As	Arsenic
ATSDR	Agency for Toxics Substances and Disease Registry
AWRP	Anacostia Watershed Restoration Partnership
BARC	Beltsville Agricultural Research Center
BMP	Best management practice
CBP	Chesapeake Bay Program
CBT	Chesapeake Bay Trust
CCC	Criteria continuous concentration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R.	Code of Federal Regulations
CIP	Consolidated implementation plan
CMC	Criteria maximum concentration
CSO	Combined sewer overflow
CSS	Combined sewer system
Cu	Copper
CWA	Clean Water Act
DC	District of Columbia
D.C.M.R.	District of Columbia Municipal Regulations
DDD	4,4’-dichlorodiphenyldichloroethane
DDE	4,4’-dichlorodiphenyldichloroethylene
DDT	4,4’-dichlorodiphenyltrichloroethane
DMR	Discharge monitoring report
DOEE	District of Columbia Department of Energy and Environment
EFDC	Environmental Fluid Dynamics Code
EPA	U.S. Environmental Protection Agency
FS	Feasibility study
g/year	Gram per year
HE	Heptachlor epoxide
HH	Human health

JBAB	Joint Base Anacostia-Bolling
LA	Load allocation
LSPC	Loading Simulation Program in C++
LTCP	Long term control plan
MD	Maryland
MOS	Margin of safety
MS4	Municipal separate storm sewer system
MSGP	Multi-Sector General Permit
MWCOG	Metropolitan Washington Council of Governments
NPDES	National Pollutant Discharge Elimination System
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PECS	Potential environmental cleanup sites
PEPCO	Potomac Electric Power Company
PPB	Parts per billion
ROD	Record of decision
RI	Remedial investigation
TEQ	Toxic equivalent
TMDL	Total maximum daily loads
TSS	Total suspended solids
USGS	U.S. Geological Survey
WLA	Wasteload allocation
WNY	Washington Navy Yard
WQC	Water quality criteria
WQLS	Water quality limited segments
WQS	Water quality standards
Zn	Zinc
µg/L	Microgram per liter

1 INTRODUCTION

Section 303(d) of the Clean Water Act (CWA) and the U.S. Environmental Protection Agency's (EPA) implementing regulations require states and jurisdictions to identify and list waterbodies, or water quality limited segments (WQLS), in which required technology-based controls of a specified substance are inadequate to achieve water quality standards (WQS). For each WQLS, the state or jurisdiction is required to either establish a total maximum daily load (TMDL) of the specified substance that the waterbody can receive without violating WQS or demonstrate that WQS are being met (40 C.F.R. § 130.7). The TMDL must account for seasonal variations, critical conditions, and a protective margin of safety (MOS) to account for uncertainty.

A TMDL establishes the maximum loading of an impairing substance that a waterbody can receive and still meet WQS. WQS are the combination of a designated use for a particular body of water, the water quality criteria (WQC) designed to protect that use, and antidegradation requirements. Designated uses include activities such as swimming, protection of fish and shellfish, and the protection of human health related to consumption of fish. WQC consist of narrative statements and numeric values designed to protect the designated uses. WQC may differ in waters with different designated uses.

As part of TMDL development, and following public comment on the initial proposed revised TMDL in 2021 as described in Section 1.1.1, an effort was made to understand the effects of climate change on toxic pollutants in the Anacostia River watershed. Several analyses were completed to estimate the effects of climate change on attainment of the TMDL endpoints and to estimate timeframes associated with such attainment. These analyses provide insight on the ability to achieve water quality goals in the future and are discussed in detail in Section 7.

1.1 History of Impairment

1.1.1 District of Columbia

In 1998, the District of Columbia (District) characterized the Anacostia River and its tributaries as impaired for metals and organic pollutants on its 303(d) list of WQLS. To address these impairments, TMDLs were developed in 2003 for arsenic, copper, lead, mercury, chlordane, 4,4'-dichlorodiphenyldichloroethane (DDD), 4,4'-dichlorodiphenyldichloroethylene (DDE), 4,4'-dichlorodiphenyltrichloroethane (DDT), dieldrin, heptachlor epoxide, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs). The TMDLs in the report, "District of Columbia Final Total Maximum Daily Loads for Organics and Metals in the Anacostia River, Fort Chaplin Tributary, Fort Davis Tributary, Fort Dupont Creek, Fort Stanton Tributary, Hickey Run, Nash Run, Popes Branch, Texas Avenue Tributary and Watts Branch," were approved by EPA on August 29, 2003 with amended approval on October 16, 2003. The TMDLs in the report "District of Columbia Final Total Maximum Daily Loads for Organics and Metals in Kingman Lake" were approved by EPA on October 31, 2003.

In 2006, Friends of the Earth successfully challenged EPA's approval of several District TMDLs because they did not include a daily load expression (*Friends of the Earth vs. the Environmental Protection Agency,* 446 F.3d 140, 144 (D.C. Cir. 2006)). The court ruled that "daily means daily". Following that litigation, Anacostia Riverkeepers, Friends of the Earth, and Potomac Riverkeepers filed a complaint (Case No.: 1:09-cv-00098-JDB) on January 15, 2009, because numerous other EPA-approved District TMDLs did not have daily load expressions. In that case, the court ordered that EPA's approval of all the TMDLs challenged, including those for toxic pollutants, be vacated, but stayed vacatur to allow EPA and Department of Energy and Environment (DOEE) time to develop daily loads. EPA's approval of the 2003 Kingman Lake TMDLs was not challenged in that case. The toxic pollutant TMDLs established herein for the Anacostia River and its tributaries represent the last of the TMDLs that were the subject of the 2009 lawsuit that still require daily loads. A draft TMDL report was released for a 30-day public comment period on July 9, 2021. The comment period was extended by one week at the request of a stakeholder organization, so it ultimately closed on August 13, 2021. In addition, a public meeting was held on July 22, 2021, to provide an overview of the draft TMDLs to the public. Numerous comments were submitted by several stakeholders during the comment period. After several requests from EPA for extension of the stay of vacatur since the original court ruling, the stay was most recently extended until April 1, 2024 to allow additional time to consider and respond to the public's comments.

The TMDLs presented in this report will, when approved by EPA, supersede the 2003 Anacostia River and tributaries Organics and Metals TMDLs and the 2003 Kingman Lake Organics and Metals TMDLs.

Most of the original toxic pollutant impairments identified in the 1998 303(d) list were based on very limited data, including macroinvertebrate data and some fish tissue data collected from the mainstem Potomac and Anacostia Rivers but not from specific tributaries. Consequently, to develop these TMDLs, DOEE reviewed available monitoring data for the existing impairments and collected additional data between 2013 and 2019 to clarify and identify the current impairment status for each of the tributaries as part of a larger effort to confirm the identified impairments for toxic pollutants across the District. The samples were analyzed for metals, organochlorine pesticides, and PAHs, among other pollutants. As part of its 2022 Integrated Report, DOEE assembled and evaluated the available water quality data for toxic pollutants and reevaluated previous impairment listings. This reevaluation of toxic pollutant impairments resulted in a number of revisions to DOEE's Section 303(d) list and to waterbody-pollutant combinations historically identified in Category 4a as being impaired, but for which a TMDL had been established. Overall, this reevaluation confirmed that many existing toxic pollutant impairments for many waterbody-pollutant combinations were supported by adequate data. In some cases, DOEE's reevaluation demonstrated that, with respect to some waterbody-pollutant combinations, the available water quality data did not demonstrate an exceedance of water quality criteria. In other cases still, DOEE's reevaluation identified additional toxic pollutant impairments for certain waterbody-pollutant combinations that had not been previously identified by DOEE on its Section 303(d) list or Category 4a of its Integrated Report. As of the 2022 Integrated Report, the impairment listings for toxic pollutants in the Anacostia River and its tributaries in the District are based on water column exceedances of the applicable criteria. In addition, there are new listings for dieldrin in fish tissue and PCBs in fish tissue in the two Anacostia River mainstem segments (Anacostia #2 and Anacostia #1) based on exceedances of DOEE's fish tissue threshold. Table 1-1 shows the remaining toxic pollutant impairments that are addressed through these TMDLs.

TMDLs are presented for waterbody-pollutant combinations that exceeded numeric WQC. In addition, informational TMDLs[2] are presented in Appendix A for other waterbody-pollutant combinations that do not exceed any numeric WQC and therefore are not listed as impaired on DOEE's Integrated Report.

In 2007, EPA approved the "Total Maximum Daily Loads of Polychlorinated Biphenyls (PCBs) for Tidal Portions of the Potomac and Anacostia Rivers in the District of Columbia, Maryland, and Virginia" which adequately addressed PCB impairments in direct tributaries to the Potomac and Anacostia Rivers. These TMDLs included daily load expressions, therefore no additional PCB TMDLs are required for the Anacostia River watershed.

For each tributary where the data reviewed shows that a pollutant is exceeding a numeric WQC, a revised TMDL has been developed, including a daily load expression. The majority of these waterbody-pollutant combinations remained in Category 4a (waterbody is impaired and a TMDL has been developed) in the District's 2022 Integrated Report (DOEE, 2024). Rather than simply revising the existing TMDLs to establish a daily load for the toxic pollutants that were detected, DOEE elected to develop new TMDLs for these pollutants due to the following:

- Since the original TMDLs had been established in 2003, the numeric WQC for these toxic pollutants were revised. These changes are described in more detail in Section 1.4.1.
- Additional monitoring data was collected in the Anacostia River watershed to comply with requirements of the District's municipal separate storm sewer system (MS4) permit and for other District projects that could be used for modeling purposes.
- DOEE has undertaken considerable effort to develop a model for the Anacostia River as part of the Anacostia River Sediment Project (ARSP) Remedial Investigation (RI) and Feasibility Study (FS). DOEE thought that the TMDLs would benefit from the availability of this more up-to-date and sophisticated modeling framework.

[2] Section 303(d)(3) of the CWA and 40 C.F.R. 130.7(e) authorize States to develop informational TMDLs as resources allow when water quality standards are currently being met. 33 U.S.C. 1313(d)(3). The intent is to develop information and identify levels that will protect the waterbody.

Table 1-1 Toxic Pollutant[a] Impairments Being Addressed by the TMDLs. Impairments were determined as described in the District's Integrated Report (DOEE, 2024)

Segment	Uses supporting[b]	Uses not supporting[b]	Arsenic	DDD	DDE	DDT	Chlordane	Dieldrin	Heptachlor epoxide	PAHs
Anacostia #1	E	A, B, C, D	D	D		D	D	D	D	D
Anacostia #2	E	A, B, C, D	D	D	D	D		D	D	D
Kingman Lake	E	A, B, C, D	D	D		D	D	D		D
Nash Run		A, B, C, D	D					D	D	D
Popes Branch		A, B, C, D			D		D	D	D	D
Watts Branch (#1 and #2)		A, B, C, D	D					D		
Hickey Run		A, B, C, D			D					D
Fort Dupont Creek		A, B, C, D	D							
Fort Chaplin Run		A, B, C, D	D							
Fort Davis Tributary		A, B, C, D	D							
Fort Stanton Tributary		A, B, C, D	D							D
Texas Avenue Tributary		A, B, C, D	D	D	D	D	D	D	D	D

Abbreviations: DDD = dichlorodiphenyldichloroethane; DDE = dichlorodiphenyldichloroethylene; DDT = dichlorodiphenyltrichloroethane; PAHs = polycyclic aromatic hydrocarbons.

[a] Header shading color indicates type of toxic pollutant: medium blue = metals; yellow = organochlorine pesticides; green = PAHs.

[b] Uses: A = primary contact recreation; B = secondary contact recreation and aesthetic enjoyment; C = protection and propagation of fish, shellfish, and wildlife; D = protection of human health related to consumption of fish and shellfish; E = navigation.

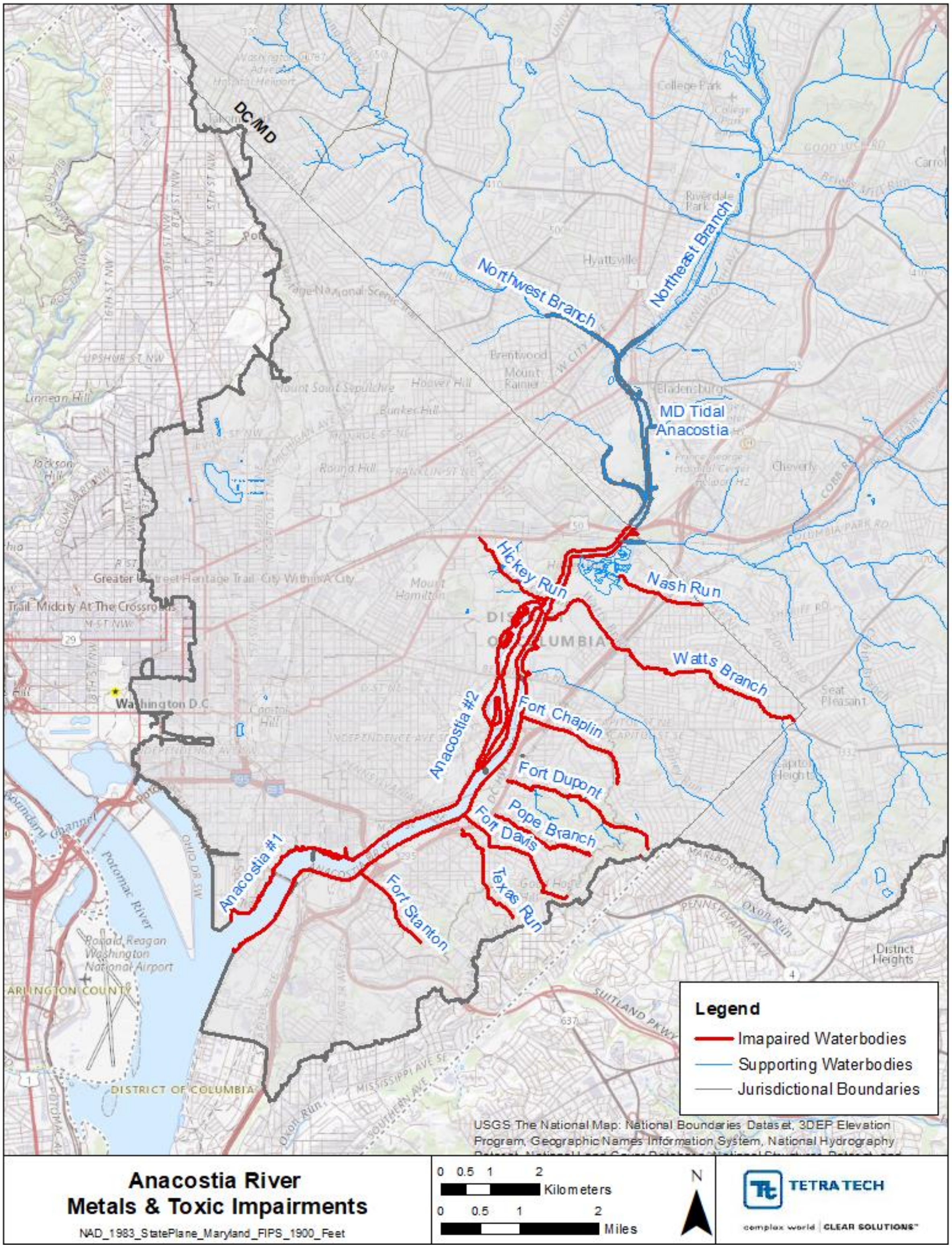

Figure 1-1 Waterbodies Impaired for Toxic Pollutants in the Anacostia River Watershed

1.2 Water Quality Model Background

The Anacostia River is a complex, tidally influenced waterbody with a drainage area that transitions from the suburban, mixed land use headwaters in Maryland to the highly urbanized District metropolitan area along its mainstem. The wide range of land cover and management conditions throughout the watershed, including legacy soil and sediment contamination, benefit from a robust modeling framework to properly simulate the hydrology, hydrodynamics, sediment, and toxics fate and transport of the system. A linked watershed/receiving water model is best suited to capture the critical system components of the Anacostia River. Such an integrated modeling system, after calibration, can appropriately represent the linkage between the sources in the watershed and legacy sources in the riverbed, as well as the impact of possible sources from the Potomac River, hence supporting the development of a comprehensive TMDL scenario.

The modeling approach selected is a linked watershed/receiving water modeling system that can describe and simulate hydrology, hydrodynamics, and pollutant loading in the Anacostia River watershed. The Loading Simulation Program in C++ (LSPC) model version 5.0 (U.S. EPA, 2009) was selected for watershed simulation and Environmental Fluid Dynamics Code (EFDC) was selected as the receiving water model for this project (Tetra Tech, 2023b). This linked watershed/receiving water modeling system was used extensively in the development of the ARSP RI and FS.

Climate change was incorporated into the linked watershed/receiving water model by developing model simulations using climate projections to simulate watershed loading, hydrodynamics, and fate and transport of toxic pollutants in the watershed for two future time horizons (Tetra Tech, 2023a). Climate change projections for rain quantity and intensity, air temperature, and sea level rise based on modeling and output data generated by the Chesapeake Bay Program Office Modeling Workgroup were used to simulate future climactic conditions. See Section 7 for further details.

1.3 Toxic Pollutants

1.3.1 Metals

Metalloids (e.g., arsenic) are elements that have a relatively high density compared to water. The density or heaviness of a metal is often correlated with toxicity, meaning that some metals can be toxic at a low level of exposure (ATSDR, 2004; ATSDR, 2007a). Although metals occur naturally in the environment, contamination of the environment results from metals that enter the environment through anthropogenic activities at levels that pose a risk to human health. Major sources include mining and smelting, industrial production and use, and domestic and agricultural use. Minor sources include corrosion, leaching, atmospheric deposition, and natural phenomena such as volcanic eruptions and weathering (ATSDR, 2004; ATSDR, 2007a).

Metals or metallic compounds can enter aquatic systems through a variety of mechanisms but the most common include stormwater runoff and industrial or domestic waste discharge. Metals can be found at elevated concentrations in the environment due to natural background conditions or contamination at hazardous waste sites. Most of the metals that reach aquatic environments will collect in the sediment of lakes, rivers, and estuaries, though a percentage can be suspended in water and can be transported through the system or into groundwater. Metals can accumulate in aquatic plants and animals, particularly fish and filter feeders (e.g., freshwater mussels). These metals can be acutely toxic at a range of concentrations.

1.3.2 Organochlorine Pesticides

Chlordane, DDT and its metabolites, dieldrin, and heptachlor epoxide are all organochlorine pesticides or pesticide degradation products. Chlordane was marketed as a mixture of compounds, including heptachlor. Technical chlordane (Chemical Abstracts Service (CAS) Registry no. 12789-03-6) can contain over 120 different compounds. In this report, chlordane refers to CAS no. 57-74-9, which is a mixture containing approximately 95% cis- and trans-chlordane isomers. These isomers are also known as α- and γ-chlordane respectively (U.S. EPA, 1997). DDT is an insecticide that degrades in the environment via microorganism action into DDD and DDE. DDD also had a limited use as a pesticide itself. Dieldrin, while an insecticide, is also a degradation product of aldrin; heptachlor epoxide is the degradation product of the pesticide heptachlor.

Organochlorine pesticides can have a wide variety of harmful acute and chronic effects on aquatic organisms, including neurological damage and endocrine disorders, and on humans, including causing illness and cancer (Nowell et al., 1999; ATSDR, 2002; ATSDR, 2007b; ATSDR, 2018; ATSDR, 2019). As a result, aside from a handful of specialized uses, all uses of chlordane, DDT, dieldrin, and heptachlor epoxide are banned by EPA or have been voluntarily withdrawn from the market by their manufacturers in the U.S. Therefore, these pesticides are no longer actively used in the District. Some of these pesticides still enter the environment during manufacturing and application in other parts of the world and may enter the U.S. via atmospheric transport. These pollutants are on the CWA's Priority Pollutant List and EPA recommends the adoption of WQC for these chemicals to protect aquatic life and human health.

Smith et al. (1998) note that organochlorine pesticides share a range of physical and chemical properties including:

- Slow degradation rates in soils and sediments;
- Very limited solubility in water;
- Strong adherence to soils or sediments;
- Dissolve readily in non-polar organic solvents and fats;
- Limited volatility (except for DDT); and
- Strong tendency to bioaccumulate in fish, plants, and animals.

These properties explain the persistence of organochlorine pesticides in the environment even though their use in the U.S. has been banned for decades. Their limited solubility in water prevents them from being rapidly flushed from a watershed and their resistance to physical or biological degradation prevents them from diminishing quickly *in situ*. For example, chlordane can persist in soils for longer than 20 years after it is applied (ATSDR, 2018). Nevertheless, concentrations of organochloride pesticides are decreasing in sediments and in fish tissue over time due to natural attenuation (Gilliom et al., 2006; Van Metre et al., 1997; Van Metre and Mahler, 2005).

1.3.3 PAHs

Polycyclic aromatic hydrocarbons (PAHs) are a group of chemicals that are formed during the incomplete combustion of gas, oil, coal, wood, trash, or other organic substances. There are over 100 documented PAHs and these often exist in the environment in complex mixtures. Important sources of PAHs in surface waters include atmospheric deposition, municipal wastewater discharge, urban stormwater runoff, and runoff and effluent from other industries and oil spills (ATSDR, 1995). In addition to occurring naturally, more simple PAHs can be manufactured as individual compounds. ATSDR (1995) identified 17 PAHs based on amount of available information, incidence in the environment, and supposed level of harmfulness. These 17 PAHs are:

- acenaphthene
- acenaphthylene
- anthracene
- benz[a]anthracene
- benzo[a]pyrene
- benzo[e]pyrene
- benzo[b]fluoranthene
- benzo[g,h,i]perylene
- benzo[j]fluoranthene
- benzo[k]fluoranthene
- chrysene
- dibenz[a,h]anthracene
- fluoranthene
- fluorene
- indeno[1,2,3-c,d]pyrene
- phenanthrene
- pyrene

There are 13 PAHs that are assigned numeric criteria in the District's WQS. All of those PAHs that exceeded a numeric WQC in the District's 2022 Integrated Report were selected for inclusion in these TMDLs (Table 1-3).

PAHs can have a wide variety of negative effects on aquatic life and systemic, immunological, neurological, developmental, reproductive, and carcinogenic effects on human health. For these reasons, EPA has promulgated regulations to protect people from contact with or inhalation and ingestion of PAHs. These pollutants are on the CWA's Priority Pollutant List and EPA recommends the adoption of WQC for these chemicals to protect aquatic life and human health.

PAHs share many physical and chemical characteristics (Smith et al., 1998), including:

- Slow biodegradation rates once sorbed to sediment;
- Relatively low solubility and vapor pressure;
- Strong tendency to partition from water into biota and particulate and dissolved organic matter;
- Strong adherence to soils and sediments; and
- Accumulation in lipid stores of aquatic organisms.

In aquatic systems, PAHs generally do not dissolve in water but rather sorb to sediment particles, settling to the river or stream bottom. Often, the PAH content of aquatic plants and animals is higher than that of the surrounding water. PAHs in the water or sediment can be broken down into more stable products by the actions of microorganisms. Additionally, studies of animals have found that PAHs that enter the body are often excreted shortly after inhalation, ingestion, or dermal exposure (ATSDR, 1995). PAHs can be persistent in soils and sediment particles found in surface waters and are ubiquitous in the environment as a result of continuous releases from combustion and contaminated soils.

1.4 Designated Uses and Applicable Water Quality Standards

TMDLs are established to determine the allowable pollutant loadings required to achieve and maintain WQS. WQS are comprised of a designated use for a particular body of water, the WQC designed to protect that use, and antidegradation requirements. Designated uses include activities such as swimming, drinking water supply, protection of aquatic life, and fish and shellfish protection and propagation. WQC consist of narrative statements and numeric values designed to protect the designated uses. Criteria may differ between waters with different designated uses. Below is specific information on the District's WQS.

1.4.1 District of Columbia

Categories of District surface water designated uses are contained in the District of Columbia Water Quality Standards, Title 21 of District of Columbia Municipal Regulations, Chapter 11 (D.C.M.R., Effective May 22, 2020). Use classes are:

Class A – primary contact recreation;
Class B – secondary contact recreation and aesthetic enjoyment;
Class C – protection and propagation of fish, shellfish, and wildlife;
Class D – protection of human health related to consumption of fish and shellfish; and
Class E – navigation.

The categories of use classes for the Anacostia River and its tributaries are listed in Table 1-2.

Table 1-2 Classification of the District's Waters

	Use Classes	
Surface Waters of the District	**Current Use**	**Designated Use**
Anacostia River	B, C, D, E	A, B, C, D, E
Anacostia River tributaries (except as listed below)	B, C, D	A, B, C, D
Hickey Run	B, C, D	A, B, C, D
Watts Branch	B, C, D	A, B, C, D

The District's WQS include both narrative and numeric criteria that protect its surface waters. 21 D.C.M.R. §1104.1 establishes the following narrative water quality criteria:

> The surface waters of the District shall be free from substances attributable to point or nonpoint sources discharged in amounts that do any one of the following:
>
> (a) Settle to form objectionable deposits;
> (b) Float as debris, scum, oil, or other matter to create a nuisance;
> (c) Produce objectionable odor, color, taste, or turbidity;
> (d) Cause injury to, are toxic to, or produce adverse physiological or behavioral changes in humans, plants, or animals;

(e) Produce undesirable or nuisance aquatic life or result in the dominance of nuisance species; or

(f) Impair the biological community that naturally occurs in the waters or depends upon the waters for its survival and propagation.

The District's numeric WQC include a criteria maximum concentration (CMC) and a criteria continuous concentration (CCC) to protect acute and chronic exposure of aquatic life (Class C waters), respectively. The CMC is the highest concentration of a pollutant to which aquatic life can be exposed for a short period (one-hour average) without deleterious effects at a frequency that does not exceed more than once every three years. The CCC is the highest concentration of a pollutant to which aquatic life can be exposed for an extended period (four-day average) without deleterious effects at a frequency that does not exceed more than once every three years.

Another numeric criterion is the 30-day average concentration that is applied for the protection of human health related to the consumption of fish and shellfish (Class D waters). For the organochlorine pesticides and some PAHs, it represents the maximum 30-day average water column concentration of a pollutant that would result in a fish tissue pollutant concentration that would not raise an individual's lifetime risk of contracting cancer from the consumption of fish by more than one in one million (Table 1-3, footnote a). For the metals and remaining PAHs, the 30-day average concentration is not associated with carcinogenicity, but rather is based on reference doses. The 30-day average is based on average body weight, fish consumption rates, and bioaccumulation rates of the pollutant in the food chain (U.S. EPA, 2014).

Since the original TMDLs were developed, certain numeric WQC for toxic pollutants were updated in the District's WQS based on EPA's nationally recommended Human Health Ambient Water Quality Criteria (U.S. EPA, 2015). The updated WQC include the latest scientific information and EPA policies that include updated exposure factors (body weight, drinking water consumption, and fish consumption rate), bioaccumulation factors, health toxicity values, and relative source contributions. For example, in updating its human health criteria, EPA updated the fish consumption rate to 22 grams per day (U.S. EPA, 2015). These human health ambient WQC updates in the District's WQS were approved by EPA on August 5, 2020. The updated criteria established in 21 D.C.M.R. §1104.8 for the TMDLs established herein are noted in Table 1-3. Further, the most stringent metal and toxic pollutant numeric WQC across both aquatic life and human health designated uses are used as TMDL endpoints. For instance, if the aquatic life WQC for a particular pollutant was more stringent than the WQC for human health for that same pollutant, the aquatic life WQC was selected as the TMDL endpoint (See Table 1-6). As required by CWA §303(d)(1)(c) and EPA's regulations at 40 C.F.R. §130.7(c)(1) the TMDLs attain and maintain all applicable WQS. Numeric WQC are particularly important where the toxicity cause is known and/or where pollutants have the potential to bioaccumulate (U.S. EPA, 2014).

In addition to the numeric criteria, TMDLs must attain and maintain the applicable narrative criteria. Narrative criteria, which supplement numeric criteria, are statements that describe the desired water quality goal (U.S. EPA, 2014). Narrative criteria are used to express a parameter in a qualitative form as opposed to the quantitative form of numeric criteria. The applicable narrative criteria in the District's WQS are those established at 21 D.C.M.R. §1104.1(d), noted above, which prohibit substances attributable to discharges in amounts that "[c]ause injury to, are toxic to, or produce adverse physiological or behavioral changes in humans, plants, or animals". EPA's Human Health Ambient WQC, which have been adopted into the District's WQS, represent the latest scientific information and policies that consider the amounts at which pollutants "are toxic to" humans using updated exposure inputs, bioaccumulation factors, and updated toxicity values (EPA, 2015). Because the TMDLs herein were developed to attain the most stringent WQC in the District's WQS regulations, attainment of these criteria will prevent injury to, toxicity to, and adverse physiological or behavioral changes in humans, plants, and animals. As a result, the TMDLs are set at levels necessary to attain and maintain the applicable narrative criteria in the District's WQS regulations.

Table 1-3 Numeric Water Quality Criteria for District Waters

Pollutant Group (where applicable)	Pollutant	Criteria for Classes (µg/L)		
		C		D
		CCC 4-Day Average	CMC 1-Hour Average	30-Day Average
--	Arsenic	150	340	0.14
--	Copper[a]	8.96[b]	13.44[b]	--
--	Zinc[a]	118.14[b]	117.18[b]	26000
--	Chlordane	0.0043	2.4	0.00032,[c]
--	Dieldrin	0.056	0.24	0.0000012,[c]
DDT	4,4'-DDD	0.001	1.1	0.00012,[c]
	4,4'-DDE	0.001	1.1	0.000018,[c]
	4,4'-DDT	0.001	1.1	0.000030,[c]
--	Heptachlor Epoxide	0.0038	0.52	0.000032,[c]
PAH 1 (2 + 3 ring)	Acenaphthene	50	--	90
	Anthracene	--	--	400
	Naphthalene	600	--	--
	Fluorene	--	--	70
PAH 2 (4 ring)	Benzo[a]anthracene	--	--	0.0013,[c]
	Chrysene	--	--	0.13,[c]
	Fluoranthene	400	--	20
	Pyrene	--	--	30
PAH 3 (5 + 6 ring)	Benzo[a]pyrene	--	--	0.00013,[c]
	Benzo[b]fluoranthene	--	--	0.0013,[c]
	Benzo[k]fluoranthene	--	--	0.013,[c]
	Dibenzo[a,h]anthracene	--	--	0.00013,[c]

	Indeno[1,2,3-c,d]pyrene	--	--	0.0013,[c]

[a] The criteria for copper, zinc, and PAH 1 were used in the calculation of informational TMDLs, provided in Appendix A, and are included in this table for informational purposes.
[b] This criterion is calculated through a hardness-based equation, as described in the District's WQS. All values reported in this table are based on a hardness value of 100 mg/L $CaCO_3$.
[c] Denotes a Class D Human Health Criteria numeric value that is based on carcinogenicity of 10^{-6} risk level.

1.5 TMDL Endpoints

TMDL development generally uses applicable numeric WQC as TMDL endpoints for impaired waterbodies. WQC are available for all current impairment listings in the Anacostia River watershed, thus the applicable WQC will be applied as TMDL endpoints. The TMDLs presented herein are protective of all applicable WQS.

Certain pollutants were grouped within the model to align with the modeling platform, minimize unnecessary modeling complexity, and maintain consistency with the original TMDLs. These groupings are included in Table 1-3. DDD, DDE, and DDT were grouped together, and the most stringent criterion of the three was used as the TMDL endpoint. Additionally, PAHs were divided into groups based on benzene ring structure and the most stringent criterion in each group was used as the TMDL endpoint. The PAH 2 group represents PAHs with four rings and the PAH 3 group represents PAHs with five and six rings.

The TMDL endpoints are presented in Tables 1-4 through 1-6. The most stringent applicable criteria are **bold** and highlighted yellow and represent criteria that were used as TMDL endpoints on which TMDL allocations were based. All applicable criteria were evaluated to ensure they were met under the TMDL modeling scenario, which was designed using the TMDL endpoints.

Table 1-4 TMDL Endpoints for Metals

Metal	CMC (1-hour average) (µg/L)	CCC (4-day average) (µg/L)	Human Health (30-day average) (µg/L)
Arsenic (dissolved)	340	150	**0.14**
Copper (dissolved)[a]	13.44[b]	**8.96[b]**	
Zinc (dissolved)[a]	**117.18[b]**	118.14[b]	26000

[a] The criteria for copper and zinc were used in the calculation of informational TMDLs, provided in Appendix A, and are included in this table for informational purposes.
[b] This criterion is calculated through a hardness-based equation, as described in the District's WQS. All values reported in this table are based on a hardness value of 100 mg/L $CaCO_3$.

Table 1-5 TMDL Endpoints for Organochlorine Pesticides

Organochlorine Pesticide	Groupings	CMC (1-hour average) (µg/L)	CCC (4-day average) (µg/L)	Human Health (30-day average, risk level of 10-6) (µg/L)
4,4, DDD	DDT	1.1	0.001	0.00012
4,4, DDE		1.1	0.001	**0.000018**
4,4, DDT		1.1	0.001	0.000030
Chlordane		2.4	0.0043	**0.00032**
Dieldrin		0.24	0.056	**0.0000012**
Heptachlor Epoxide		0.52	0.0038	**0.000032**

Table 1-6 TMDL Endpoints for PAHs

PAHs	PAH Groupings	CCC (4-day average) (µg/L)	Human Health (30-day average, risk level of 10-6) (µg/L)
Acenaphthene	PAH 1 (2 + 3 ring)	**50**	90
Anthracene			400
Fluorene			70
Naphthalene		600	
Benzo[a]anthracene	PAH 2 (4 ring)		**0.0013**
Chrysene			0.13
Fluoranthene		400	20
Pyrene			30
Benzo[a]pyrene	PAH 3 (5 + 6 ring)		**0.00013**
Benzo[b]fluoranthene			0.0013
Benzo[k]fluoranthene			0.013
Dibenzo[a,h]anthracene			0.00013
Indeno[1,2,3-c,d]pyrene			0.0013

1.5.1 Confirmation that TMDL Endpoints Address Fish-Tissue Based Impairment Listings

While the majority of the remaining impaired waterbody-pollutant combinations addressed by the TMDLs herein are based on water column criteria exceedances, there are three “Dieldrin in Fish Tissue” listings in the Upper and Lower Anacostia mainstem segments and Kingman Lake that are based on exceedances of DOEE’s fish tissue listing threshold of 2.5 parts per billion (ppb). Using the bioaccumulation factors on which the District’s water column WQC are based (EPA, 2016), translation of those WQC (and therefore, the TMDL endpoint for dieldrin) into fish tissue equivalents results in a value that is lower (i.e., more stringent) than DOEE’s fish tissue listing threshold. Therefore, the dieldrin TMDLs herein adequately address both the water column-based and fish tissue-based impairments.

2 WATERSHED CHARACTERIZATION

The Anacostia River, with its headwaters in Montgomery and Prince George’s Counties, Maryland, drains more than 170 square miles. The watershed terminates at the Anacostia River’s confluence with the Potomac River in the District of Columbia. Approximately 80 percent of the watershed is in Maryland and 20 percent is in the District. The main subwatersheds include the Northwest Branch, Paint Branch, Little Paint Branch, Indian Creek, Upper and Lower Beaverdam Creeks, the Northeast Branch, Still Creek, Brier Ditch, Fort Dupont, Popes Branch, Watts Branch, Hickey Run, and Sligo Creek watersheds. The upper tributaries are nontidal freshwater, while the mainstem of the Anacostia River is tidally influenced. Figure 2-1 depicts the subwatersheds of the Anacostia River watershed.

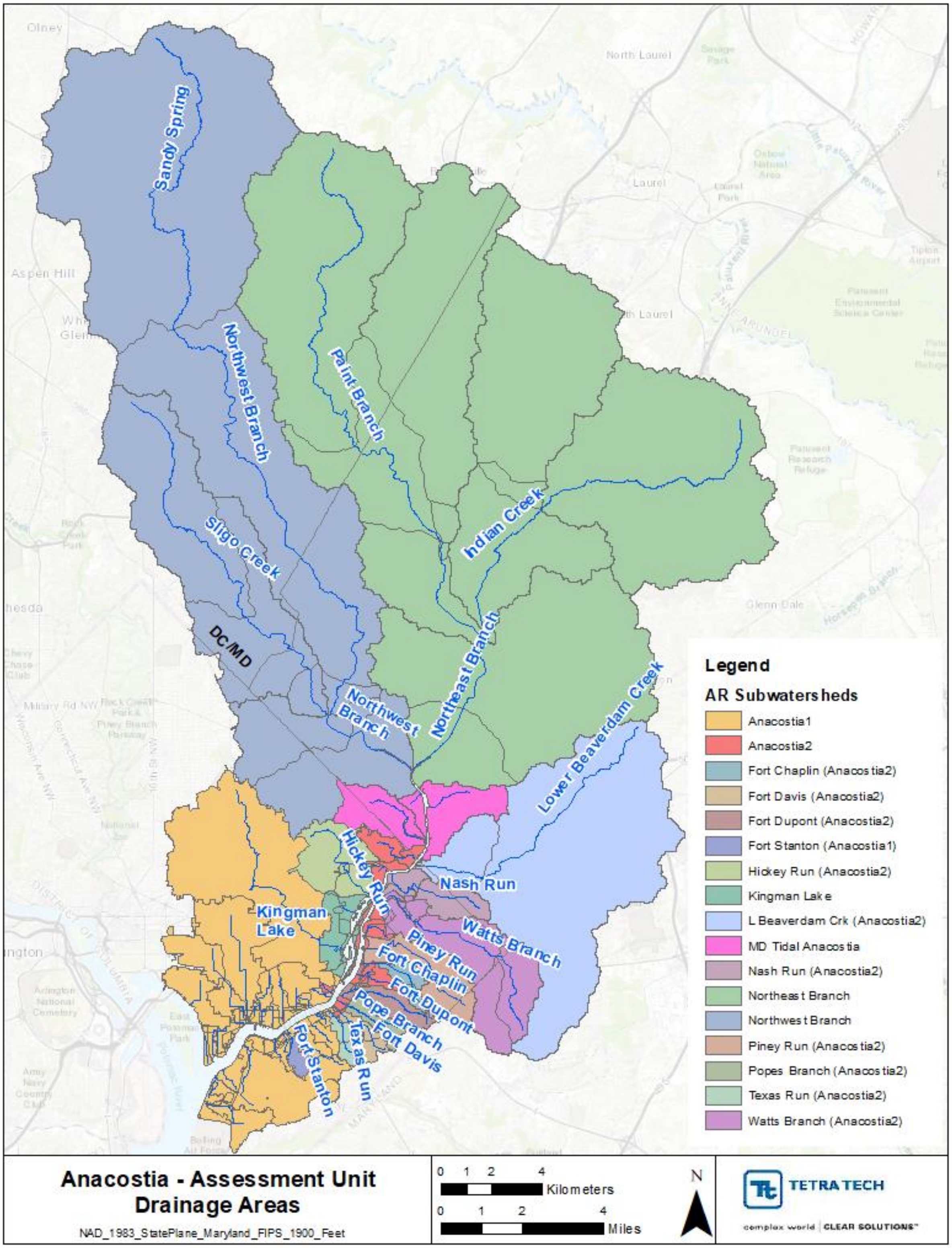

Figure 2-1 Anacostia River Watershed Assessment Unit Drainage Areas

The population residing in the Anacostia River watershed exceeds 850,000 people in the District of Columbia and Maryland. The upper portions of the watershed are in the Piedmont Plateau, which is characterized by gently rolling hills. The remainder of the watershed is in the Coastal Plain, which is somewhat flatter, but can also contain gently rolling hills. Elevations in the watershed range from sea level to about 400 feet above sea level.

The Anacostia River watershed is highly urbanized. According to the Anacostia Watershed Restoration Partnership (AWRP), established by Metropolitan Washington Council of Governments (MWCOG), about 45 percent of the watershed is residential, the dominant land use in the watershed. Undeveloped land covers just under 30 percent of the watershed. That undeveloped land is primarily comprised of forests and parks. Commercial and institutional land uses comprise more than 15 percent of the watershed. Agriculture land use makes up 4.5 percent of the watershed. Industrial land use makes up less than 4 percent of the watershed. Water and wetlands cover an additional 1 percent (ARWP, 2010).

According to the AWRP, the overall imperviousness of the watershed is 22.5 percent, although that is variable among subwatersheds. The Upper Beaverdam Creek subwatershed has the lowest level of imperviousness at 6 percent, largely because of the presence of the U.S. Department of Agriculture, Beltsville Agricultural Research Center (BARC), which occupies most of the subwatershed (AWRP, 2010). The highest levels of imperviousness are in the Hickey Run (41 percent) and the Northeast Branch (37 percent) subwatersheds (AWRP, 2010). Land use in Hickey Run is 30 percent industrial and 29 percent residential, while land use in the Northeast Branch is 51 percent residential and 10 percent commercial (AWRP, 2010). Some areas of the tidal mainstem of the Anacostia in the District, such as the northwest bank, have significantly higher levels of imperviousness (48 percent) (DDOE, 2012).

3 SOURCE ASSESSMENT

3.1 Nonpoint Sources

Probable nonpoint sources of the seven toxic pollutants are contaminated sites in the District and upstream sources originating in Maryland. Further, other processes contribute to the accumulation of toxic pollutants that can be considered part of the pollutant pathway, such as atmospheric deposition (both wet and dry deposition) of pollutants on the surrounding watershed.

3.1.1 Maryland Upstream Loads

The Maryland portion of the Anacostia River watershed comprising the Northeast and Northwest Branches drains to the Maryland portion of the tidal Anacostia River, which flows into the District portion of the tidal Anacostia River (Anacostia #2 tidal segment) (See Figure 2-2). In addition, several tributaries to the Anacostia River (e.g., Lower Beaverdam Creek, Watts Branch, and Nash Run) originate in Maryland and flow into the District portions of these waters, which then flow directly into the District portion of the tidal Anacostia River (Anacostia #2 tidal segment) (See Figure 2-1).

This TMDL report presents this upstream loading from Maryland for all seven toxic pollutants. These upstream loads are presented as a single value, representing the total load from the upstream subwatershed; however, it could include both point and nonpoint sources. For the purposes of this analysis, the load is treated as a single nonpoint source load (See Section 3.3.5 of the TMDL Modeling Report for more information) (Tetra Tech, 2023b).

3.1.2 Contaminated Sites

Nonpoint sources contributing toxic pollutant loads to the Anacostia River and its tributaries include losses from historically contaminated sites and current industrial operation areas that are not regulated by National Pollutant Discharge Elimination System (NPDES) permits.

A list of contaminated sites and industrial operation areas and their brief history can be found in Table 3-1. The location of each site can be found in Figure 3-1. The sites listed in Table 3-1 are identified as Potential Environmental Cleanup Sites (PECS) for purposes of the ARSP. A PECS is as an area along the river where current or historical activities include the storage, handling, use, or potential release of hazardous substances or petroleum products (DOEE, 2020a). The ARSP RI Report summarizes contaminant data for each PECS (Tetra Tech, 2019a). In addition, contaminant source assessments were completed for over 70 chemicals in water and sediment to identify active sources of contaminants (Tetra Tech, 2019b). The results of the assessments suggest that PECS are potential sources based on elevated factor scores for metals, PAHs, and PCBs. In addition, contaminant releases from PECS may contribute to pollutant discharges in the ARSP study area, and investigations of the nature and extent of contaminated sediment associated with these sites are being or have been conducted, in some instances by Potentially Responsible Parties (PRPs) who may be liable for the costs of cleanup and natural resource damages associated with the releases from the PECS (DOEE, 2022b).

For this TMDL, representative loads for these sources were developed from monitoring data in available literature and simulated rainfall-runoff and pollutant loading relationships for the watershed land areas.

Table 3-1 List of Historic Contaminated Sites along the Anacostia River

Site	Description
Firth Sterling Steel	The Firth Sterling Steel Co., built in 1906 and 1907, made steel casings for artillery shells. The casting plant closed in the 1920s. Joint Base Anacostia-Bolling currently occupies the site.
Former Hess Petroleum Terminal	This site is located in southeast Washington, D.C., just south of Nationals Park and north of the Anacostia River. Hess operated a bulk petroleum storage facility from 1968 until approximately 1983, and from 1984 to 1985.
Former Steuart Petroleum	Located on M Street SE along the western bank of the Anacostia River, this site was a bulk fuel storage and distribution facility by Steuart Petroleum company from 1948 to 1996.
Fort McNair	Fort McNair is a United States Army post located on the tip of Buzzard Point, at the confluence of the Anacostia and Potomac Rivers. Originally named Washington Arsenal, the fort has been an army post for more than 200 years.
Joint Base Anacostia-Bolling	Joint Base Anacostia-Bolling (JBAB) is a 966-acre military installation, located in southeast Washington, D.C., situated between the Potomac and Anacostia Rivers. JBAB was established in 2010 under U.S. Navy lead. In 2020, the Base's lead service authority was transferred to the U.S. Air Force.
Kenilworth Park Landfill	The Kenilworth Park Landfill Site is located within Anacostia Park, a unit of National Capital Parks – East, on the eastern bank of the Anacostia River. From 1942 until 1970, as permitted by

	the Federal Government (War Department), the District used the site for municipal solid waste disposal. Municipal waste incineration, incinerator ash disposal, and landfilling of municipal solid waste occurred at the site. By the 1970s, the entire landfill had ceased operations, was covered with soil, revegetated, and reclaimed for recreational purposes.
Poplar Point	The Poplar Point site is located in Anacostia Park in southeast Washington, D.C., approximately one mile upstream of the confluence of the Anacostia and Potomac Rivers. The Poplar Point area has undergone a variety of land use changes including nursery and greenhouse operations and naval operations. The site is home to Headquarters for National Capital Parks – East, U.S. Park Police Anacostia Operations Facility, and U.S. Park Police Aviation Unit facilities, and includes various storage buildings, wetlands, and managed meadows.
Southeast Federal Center	The Southeast Federal Center is a site in the southeast quadrant of the District along the Anacostia River. The site had previously been used for shipbuilding (1800s) and was later heavily industrialized by ordinance manufacturing through WWII.
Washington Gas	Washington Gas – East Station Site is located in southeast Washington, D.C. along the western bank of the Anacostia River, south of M Street and east of 11th Street. The site includes areas impacted by the residuals of gas manufacturing from a former manufactured gas plant that once operated on an adjacent parcel of land to the north.
CSX Benning Yard	CSX Benning Yard located at 225 33rd Street, SE, Washington, D.C. is an active railroad switching yard. Historically, a portion of Benning Yard was used to store and dispense diesel fuel to locomotives. In 2004, a new office building and parking facility were constructed in the area where fueling operations had previously been conducted.

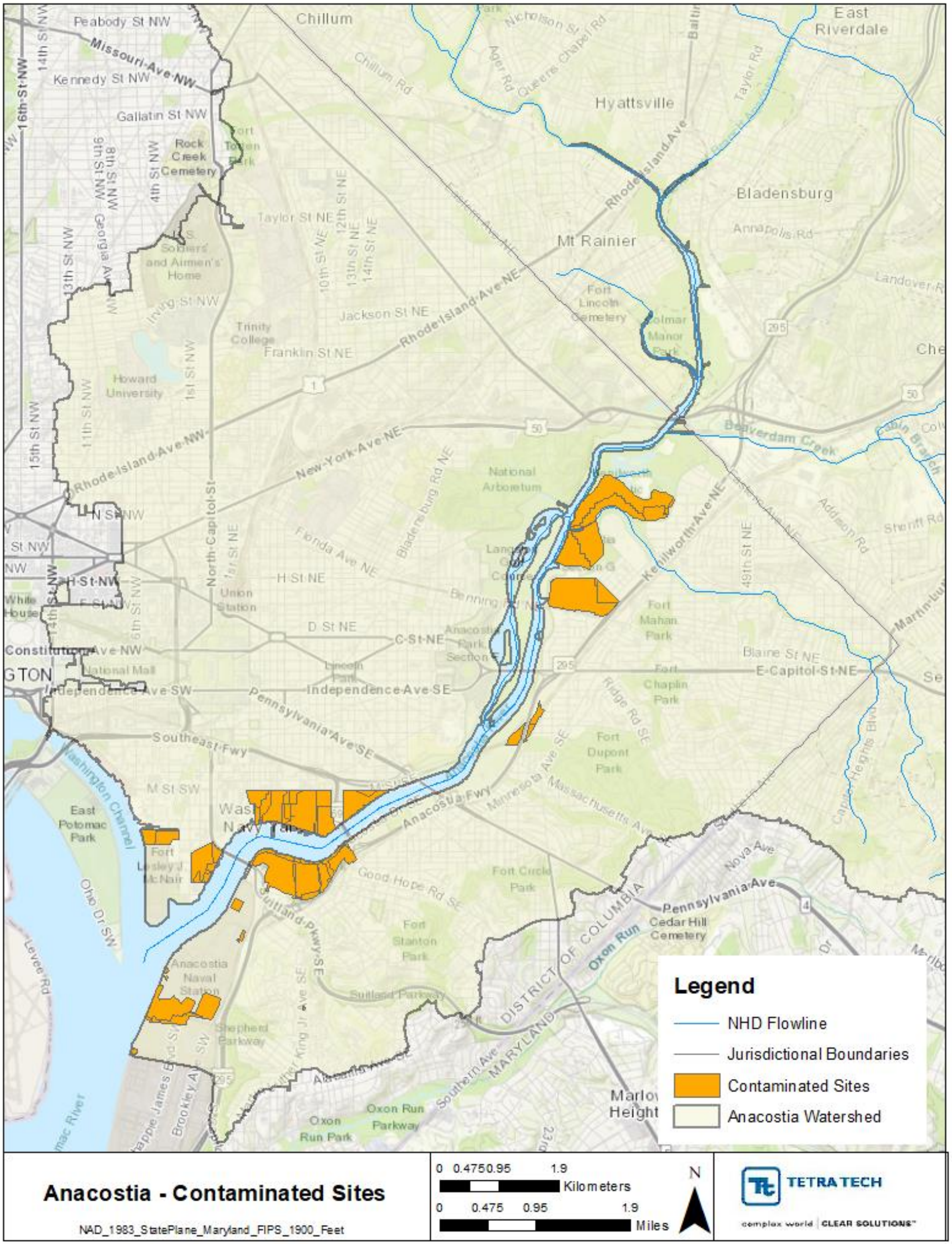

Figure 3-1 Location of Potential Contaminated Sites in the Anacostia River Watershed

3.1.3 Other Pollutant Pathways

Atmospheric Deposition

Atmospheric deposition may transport metals and persistent organic pollutants to the Anacostia River watershed, although other pollutant pathways, such as groundwater and interflow pollutant pathways and stormwater/surface runoff pollutant loading, transport a greater quantity of toxic pollutants to the system. Additionally, atmospheric deposition of these toxic pollutants is expected to decrease over time since the production and use of many of the toxic pollutants are now banned. Atmospheric deposition was included as a pollutant loading pathway to surface and groundwater simulated in the watershed model. The watershed model included two atmospheric loading rates to account for both dry and wet deposition. Data used to inform these loading rates came from the ATSDR toxicological profiles for each pollutant. In some cases, loading rates for certain pollutants were negligible and were not included as a pathway (e.g., PAHs in dry deposition due to their hydrophobic nature). Atmospheric deposition was not assigned a baseline load or TMDL allocation because the loads associated with this pathway were incorporated into the loads from watershed runoff to surface waters and groundwater.

Resuspension and Diffusion from Bottom Sediments

The transport of toxic pollutants from bottom sediments to the water column through resuspension and diffusion can be a major pathway of toxic pollutants to the Anacostia River, particularly in the tidal segments. However, bottom sediments were not assigned a baseline load or TMDL allocation under the framework of these TMDLs because resuspension and diffusion from the bottom sediments to the water column is not considered a nonpoint source requiring a reduction. The linked watershed-receiving water model developed for these TMDLs simulates conditions within the water column and sediment as a single system. Therefore, exchanges between the sediment and water column are considered an internal pathway. Furthermore, modeling both media as part of one internal system is appropriate because elevated levels of toxic pollutants in fish tissue are a function of both water column and bottom sediment concentrations.

Many of these toxic pollutants, particularly the persistent organic pollutants, preferentially sorb to the organic carbon fraction of suspended sediment in the water column and settle on the river bottom, accumulating in the bottom sediments, with the bottom sediments functioning as a pollutant sink. Over time, this accumulation of pollutants within the bottom sediment can also become a pathway for contaminants to reach the water column via the disturbance and resuspension of sediments. Additionally, dissolved pollutant concentrations in sediment pore water can diffuse into the water column depending on the concentration gradient between the overlying water and the underlying bottom sediments. Please see Section 5.4 for more information on how toxic pollutant concentrations in the bottom sediment were addressed in these TMDLs.

3.2 Point Sources

For this TMDL, point sources include individually permitted facilities, stormwater discharges (i.e., MS4 and entities covered under the Multi-Sector General Permit (MSGP)), and discharges from the combined sewer system (CSS).

3.2.1 Individually Permitted Facilities

The individually permitted facilities included as potential sources of these toxic pollutants are the Washington Navy Yard (WNY), PEPCO Environment Management Services (hereafter referred to as PEPCO), Super Concrete Corporation (hereafter referred to as Super Concrete), and District of Columbia Water and Sewer Authority (DC Water) Outfall 019. A map of the permitted facilities is included in Figure 3-2 and associated facility information and EPA NPDES Permit number can be found in Table 3-2.

For existing conditions, discharge monitoring reports for each facility were used to characterize flow and toxic pollutant concentrations. Typically, discharge monitoring report (DMR) data included flow, but not toxic pollutant concentrations. For facilities that did not have data enumerating toxic pollutant concentrations, the WQC for toxic pollutants (e.g., DDT, chlordane, dieldrin) in the District's WQS were used.

The Naval District Washington, also known as the WNY, occupies about 80 acres on the banks of the Lower Anacostia River and borders the eastern boundary of the Southeast Federal Center. It served as a major shipbuilding facility and gun factory during 19th century. In 1961, gun production ceased and the facility was converted to administrative and supply use. Since there was no DMR data for the toxic pollutant concentrations, the WQC concentrations for toxic pollutants (e.g., DDT, chlordane, dieldrin) in the District's WQS were used.

PEPCO at the Benning Service Station is authorized to discharge to the Anacostia River. To calculate toxic pollutant loads, discharge monitoring data for flow was used. Since there was no DMR data for the toxic pollutant concentrations, the WQC concentrations for toxic pollutants (e.g., DDT, chlordane, dieldrin) in the District's WQS were used.

Both WNY and PEPCO were included in the model as dual sources. This means that toxic pollutant loads associated with the individual NPDES permits and their status as contaminated sites were used in calculating TMDL allocations. To calculate toxic pollutant loads for WNY and PEPCO as contaminated sites, these facilities were delineated as subbasins and were simulated based on associated runoff and toxic pollutant loading characteristics.

The load attributed to Super Concrete is uniquely circumstanced in that the facility is located in the District and discharges to a waterbody in the District, but the load from the facility ultimately enters the Anacostia River from Maryland. Super Concrete is authorized to discharge from Outfall 004 to an unnamed tributary in the District which then flows eastward across the District/Maryland boundary and ultimately drains into the Maryland Northwest Branch of the Anacostia River. As Super Concrete is a District NPDES point source, it is being given a WLA, but because the load from Super Concrete enters the Anacostia River from Maryland, the WLA is presented in the TMDL tables as a component of the MD Upstream Load source. Since there was no DMR data for toxic pollutant concentrations, the WQC concentrations for toxic pollutants (e.g., DDT, chlordane, dieldrin) in the District's WQS were used.

For this TMDL, Outfall 019, which used to discharge to the Anacostia River, was included as a source. The TMDL model simulation period was from 2014 through 2017; therefore, it does not account for the on-the-ground changes including permanent closure of the Northeast Boundary Swirl Concentrator Facility and completion and operation of the Anacostia River Tunnel since March 2018 and the Northeast Boundary Tunnel since September 2023.

Table 3-2 Individual NPDES permits represented in the Anacostia Toxic Pollutants Model

NPDES Permit No.	Facility Name	Type	Outfall Number	Latitude	Longitude
DC0000094	PEPCO Environment Management Services	Industrial	013, 101	38.9000	-76.9583
DC0000141[1]	Washington Navy Yard	Industrial	001,005, 006, 007, 008, 009, 013, 014, CSO-14F, CSO-15G, CSO-15H, MS4-01E	38.87194	-76.991389
DC0000175	Super Concrete Corporation	Industrial	004	38.9486	-77.0058
DC0021199	Outfall 019 (Northeast Boundary Swirl Concentrator Facility)	Preliminary CSO Treatment	019	38.8725	-77.0025

[1]Included in the allocation tables as a WLA for the Washington Navy Yard; representative latitude/longitude is for outfall 001.

3.2.2 Stormwater

For stormwater discharges, the toxic pollutant loads were determined for both the District's MS4 and the permitted sites that receive coverage from the MSGP for Industrial Activities. The MS4 is located along the outer edges of the city and surrounds the CSS that serves the inner portions of the city (Figure 3-2). Watershed simulations for the contributing areas were used to estimate toxics pollutant loads from the MS4.

The contributing toxic pollutant loading from sites under the MSGP were estimated using a GIS overlay of site boundaries, land cover data, and unit area runoff data. The GIS overlay included parcel areas for 16 permitted stormwater commercial and industrial facilities. The GIS overlay was also used to identify the assessment unit in which each of the MSGP facilities was located. The allocations for MSGP facilities were calculated based on the proportion of the area of the facility located in each of the assessment units. These MSGP areas were used to tabulate annual average and maximum daily WLAs for each facility based on the proportion of the facility's parcel area compared to the total MSGP parcel area and multiplied by the total MSGP WLA of the assessment unit. Aggregate annual average and daily allocations assigned to the MSGP were refined to assign an annual average and maximum daily WLA to each individual facility covered under the MSGP in the District. Providing individual annual average and maximum daily WLAs to facilities covered under the MSGP in the District represents a revision from the earlier draft of the TMDLs that was released for public notice and comment in 2021. Individual WLAs for facilities covered under the MSGP in the District are not based on site specific or discharge specific data. In the event that site specific data reveals that a particular facility is not discharging the pollutants of concern at levels that have a reasonable potential to cause or contribute to an exceedance of water quality criteria, the permittee's compliance with the general permit would be consistent with the assumptions and requirements of these TMDLs. In the event that the number of facilities in the District covered under the MSGP increases with a future general permit reissuance, any new facilities may not discharge at concentrations greater than the applicable water quality criteria at the end of the discharge pipe.

Toxic pollutant loads were also estimated for the CSS using the watershed model. A map of areas covered by the CSS can be found in Figure 3-2. Overflow relationships were developed to determine combined sewer overflow (CSO) during substantial rainfall events. Toxic pollutant concentrations were then assigned to overflows based on simulated in-stream concentrations. The TMDL model simulation period was from 2014 through 2017 and, therefore, it does not account for the on-the-ground changes due to the operation of the Anacostia River Tunnel System since March 2018 and September 2023.

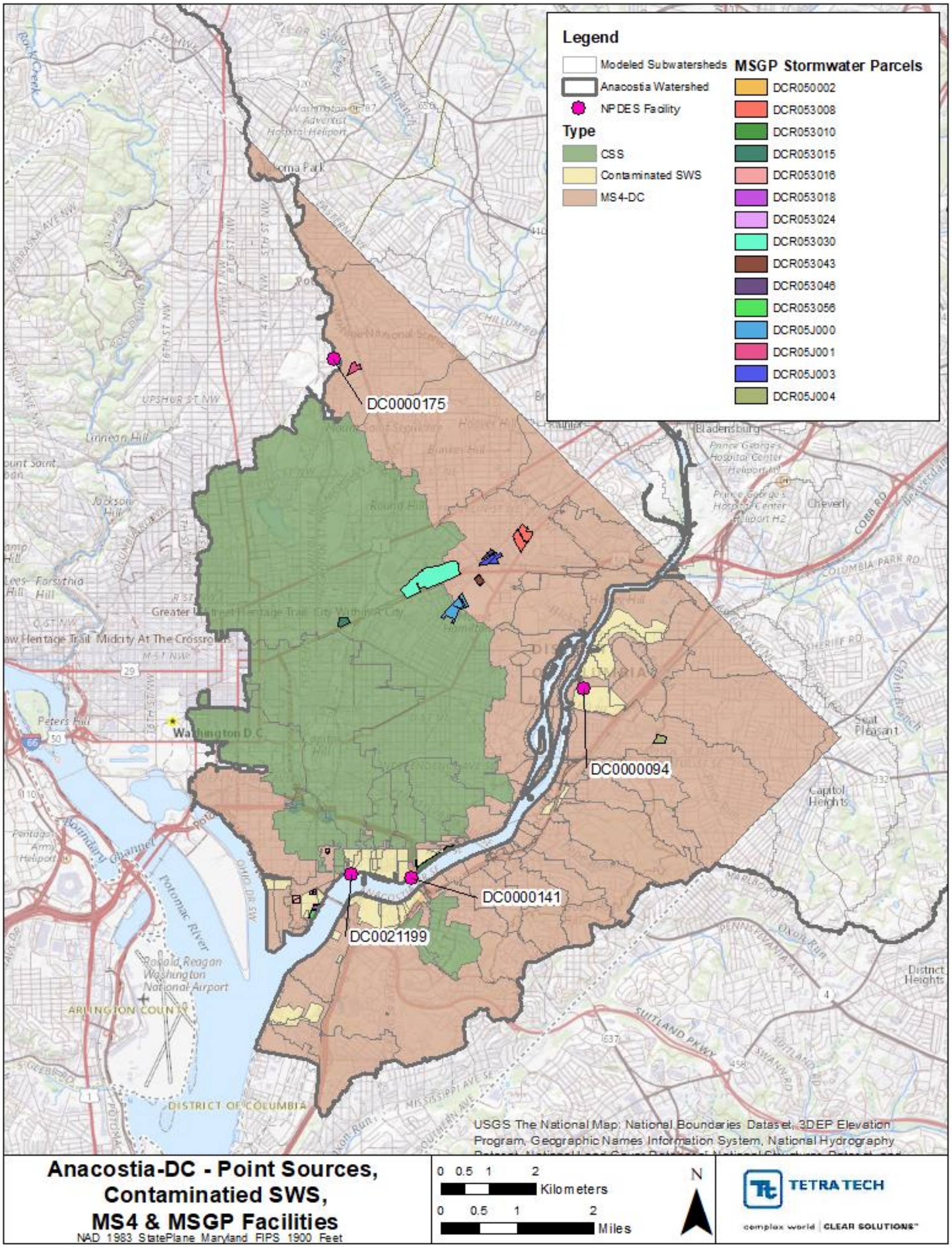

Figure 3-2 Locations of MS4, CSS, MSGP, and Contaminated Site Subwatersheds in the District

3.3 Source Assessment Summary

All identified nonpoint and point sources of metals (arsenic), organochlorine pesticides (chlordane, DDT and its metabolites, dieldrin, heptachlor epoxide), and PAHs in the District's portion of the Anacostia River, its tributaries, and Kingman Lake have been characterized. The source assessment for the District captures point and nonpoint sources within the District's boundaries and also incorporates the upstream loads from Maryland. As the Anacostia River is an interjurisdictional water, it is important to capture the loads from each jurisdiction. For each pollutant in the District, the upstream Maryland segments (Northeast Branch, Northwest Branch, MD Tidal Anacostia) and the tributaries to the Anacostia River that originate in Maryland (Nash Run, Watts Branch, and Lower Beaverdam Creek) are included as upstream loads to the District. The only nonpoint sources of toxic pollutants in the District are stormwater runoff from historically contaminated sites (Table 3-1). These contaminated sites are assigned baseline loads and load allocations.

Stormwater runoff is a major source of toxic pollutants to the Anacostia River watershed. The majority of stormwater runoff in the District is captured by the MS4 or the CSS. The MS4 and CSS are the sources within the District that contribute the largest loads of toxic pollutants to the river system. Other sources that capture and convey stormwater include other point sources that are regulated under NPDES (e.g., sites that have coverage under the MSGP and individually permitted facilities). These permitted facilities include both stormwater and process water discharges to the Anacostia River and are listed in Table 3-4. Facilities with individual NPDES permits that are not expected to discharge significant quantities of these toxic pollutants are provided a baseline load and allocation, but no percent reduction. This applies to both the DC Water Outfall 019 and Super Concrete Corporation. They were included in the model to accurately represent all potential sources of toxic pollutants in the Anacostia River watershed in the District. A summary of the baseline loads for the impaired District segments can be found in the allocation tables in Section 6.4.

4 MODELING APPROACH

A linked watershed/receiving water model is best suited to capture the critical system components of the Anacostia River. An integrated modeling system, after calibration, appropriately represents the linkage between the sources in the watershed and legacy contamination in the riverbed, as well as the impact of possible contaminant flux from the Potomac River, hence supporting the development of a comprehensive TMDL scenario. This system can describe and simulate hydrology, hydrodynamics, and pollutant loading in the Anacostia River watershed.

A watershed model is a series of algorithms applied to watershed characteristics and meteorological data to simulate land-based processes over a selected period, including rainfall-runoff, interflow, groundwater flow, flow routing, water temperature, and pollutant loadings. Watershed models often use build-up and wash-off representations of pollutants on land surfaces and can accommodate other processes including pollutant-soil/sediment association, subsurface pollutant transport, and atmospheric deposition of pollutants.

Receiving water models are composed of a series of algorithms to simulate water circulation, water temperature, suspended sediment transport, fate and transport of contaminants, and kinetics and transport of conventional water quality constituents of the waterbody. External forces are applied including meteorological data, flow and pollutant loadings from point and nonpoint sources, and other boundary conditions. The models are used to represent physical, chemical, and biological aspects of a lake, river, or estuary. These models vary from simple one-dimensional box models to complex three-dimensional models capable of simulating water movement, salinity, temperature, sediment transport, pollutant transport, and bio-chemical interactions occurring in the water column.

Watershed models can provide flow and pollutant loading (boundary conditions) to a receiving water model and can also simulate water quality processes within streams and lakes with relatively simple algorithms. Receiving water models can simulate detailed processes in rivers, lakes, and estuaries. More specifics on the model domains and their configuration used in these TMDLs are discussed below.

The rest of Section 4 and Sections 5.2 through 5.4 describe only a few key aspects of the linked watershed/receiving water model for the Anacostia River watershed. These pertinent sections are included to aid in the understanding of how the TMDL allocations were developed. A complete description of the modeling framework, its configuration, and calibration are included in the separate TMDL modeling report (Tetra Tech, 2023b).

4.1 Loading Simulation Program in C++ (LSPC) Configuration

The Loading Simulation Program in C++ (LSPC) model version 5.0 (U.S. EPA, 2009) is the platform selected for watershed simulation and toxic pollutants TMDL development for the Anacostia River, its tributaries, and Kingman Lake because it meets the above criteria. A calibrated watershed model was used to characterize loadings from the Anacostia River watershed beginning at the headwaters in Maryland, ensuring that all major watershed sources and pathways are represented, including catchments adjacent to the tidal reaches of the Anacostia River. The watershed model estimated the relative pollutant contributions from multiple sources and connected these contributions to the spatial distribution of contamination over time. For TMDL development, the applied model possessed the following capabilities, making it a scientifically sound representation of the watershed loading and transport system and an advantageous management tool:

- Simulated hydrologic variations due to time variable weather patterns and the related transient saturation or unsaturated condition of the land surface/subsurface.
- Simulated time variable chemical loadings from various sources in the watershed, including the sediment associated pollutants (metal, organochlorine pesticides, and PAHs) that are the target of TMDL development.
- Simulated interactions within a stream channel.
- Provided model results with a broad range of spatial and temporal scales.
- Evaluated source loading abatement scenarios for water quality control/management design.

4.2 Environmental Fluid Dynamics Code (EFDC) Configuration

A receiving water model was used given the complex flow dynamics in the tidal Anacostia River, coupled with the variable hydrologic inputs from the surrounding watershed. Environmental Fluid Dynamics Code (EFDC) was selected as the receiving water model for this project (Tetra Tech, 2023b). Previous receiving water studies completed in the Anacostia River provide a strong basis for using an EFDC framework for the tidal Anacostia River (Tetra Tech, 2019a). The EFDC model has been applied worldwide for both hydrodynamic and water quality applications and can be easily linked to the LSPC watershed model, which was used to represent watershed source loadings.

EFDC is a general-purpose modeling package for simulating one- or multi-dimensional flow, transport, and bio-geochemical processes in surface water systems including rivers, lakes, estuaries, reservoirs, wetlands, and coastal regions. The EFDC model (Hamrick, 1992) was originally developed at the Virginia Institute of Marine Science for estuarine and coastal applications and is considered public domain software. This model is EPA-supported and is used extensively to support receiving water modeling studies and TMDLs throughout the world.

Modeling the Anacostia River to develop these TMDLs requires evaluating source-response linkages and estimating existing loadings. As part of the linked modeling system, the EFDC model provides a dynamic representation of hydrodynamic conditions, conventional water quality conditions, sediment transport, and toxic pollutant concentrations in the tidal Anacostia River. Flows, suspended sediment, and pollutant loads from the catchments adjacent to the tidal Anacostia River are described using the LSPC model.

In tidal systems such as the tidal Anacostia River, the transport of particulate and dissolved materials is a process governed by the interaction between freshwater inflows, ocean tidal oscillations, and windshear over the water surface. During periods of high tributary inflows, estuary processes are mostly driven by advective transport and have a higher flushing capacity. During periods of low tributary inflows, conversely, the estuary processes are more influenced by dispersive transport largely driven by tidal dynamics.

5 TMDL DEVELOPMENT

5.1 Overview

The purpose of a TMDL is to allocate allowable loads among different pollutant sources to achieve WQS (U.S. EPA, 1991). This TMDL considers all significant sources contributing metals, organochlorine pesticides, and PAHs to the impaired waters. The sources can be separated into point and nonpoint sources.

The TMDL was calculated using the following equation:

TMDL = WLA + LA + MOS

Where, WLA = sum of the wasteload (regulated or point source) allocations

LA = sum of load (nonpoint source) allocations; and

MOS = margin of safety

This report addresses 13 WQLS and seven impairing toxic pollutants (Table 1-1). This translates to a total of 48 TMDLs established for impaired waterbody-pollutant combinations in the Anacostia River, its tributaries, and Kingman Lake. The remaining 72 waterbody-pollutant combinations are provided informational TMDLs in Appendix A as these waterbody-pollutant combinations are not listed as impaired on DOEE's 2022 Integrated Report (DOEE, 2024). The LAs and WLAs are provided in Section 6.3 and Section 6.4 for each of the impaired waterbody-pollutant combinations. Although a TMDL allocation is provided for each impairment, it is important to recognize the inter-connectedness of the impaired waterbodies. Many tributaries to the Anacostia River begin in Maryland (e.g., Lower Beaverdam Creek, Watts Branch, Nash Run), cross jurisdictional lines into the District, and meet the Anacostia River mainstem at their confluences within the District. Additionally, upstream segments of the mainstem Anacostia River in

Maryland (i.e., Northeast and Northwest Branches, MD Tidal Anacostia) flow directly into downstream segments in the District (i.e., Anacostia #2 and #1). These tidal waters move toxics pollutant loads between the WQLS. Therefore, the TMDLs for the Anacostia River can be viewed as a package of allocations.

5.2 Baseline Scenario

The existing conditions of pollutant concentrations were determined from available monitoring data. Sources of pollutants that were considered included urban, agricultural, and other runoff, point source discharges, and spills and/or leaks (i.e., contaminated sites and industrial operation areas contributing contaminant loads). Other pollutant pathways and processes that were considered included atmospheric deposition, legacy contaminants in bed sediments of the Anacostia River, and groundwater contributions to both the Anacostia River and its tributaries. Sources of existing data considered can be grouped into three general categories: toxic pollutant monitoring data (e.g., agency monitoring, NPDES DMRs, the ARSP), general watershed characteristic data (e.g., land use, meteorological, USGS gages), and other data from a large body of literature (e.g., pollutant toxicological profiles). Relevant, existing data were used as inputs to the linked watershed (LSPC) and receiving water models (EFDC). Specifics on the data sources used can be found in the TMDL Modeling Report (Tetra Tech, 2023b). Additional details on source considerations can be found in Section 3 of this TMDL report.

The linked models were simulated over a four-year period from 2014-2017 to capture a representative period of existing conditions in the Anacostia River system. Initially, baseline conditions were simulated for each identified source for each of the ten pollutants in every subwatershed. A calibration process was completed using the large dataset compiled on existing data and simulated data. Daily, monthly, seasonal, and total modeled flow volumes were compared to observed data, and error statistics were calculated. Model results were also visually compared to observed data using time series plots, and additional graphical and tabular monthly comparisons were performed. Once it was determined that the model simulation appropriately captured existing conditions when compared to observed data, the calibration was deemed acceptable and the process of developing a TMDL scenario was begun. When considering the acceptability of the calibration, focus was placed on the accurate representation of the trends, relationships, and magnitudes and, thus, the underlying physics and kinetics. A more in-depth description of model calibration can be found in Sections 5 and 6 of the TMDL Modeling Report (Tetra Tech, 2023b).

5.3 TMDL Scenario

The development of a TMDL scenario is the process of reducing pollutant loads to achieve the applicable TMDL endpoints, which are the most stringent WQC for each specific pollutant or pollutant group. The TMDL scenario was developed through an iterative process of first implementing watershed reductions until the endpoints were met in the tributaries and then evaluating whether those reductions were sufficient to meet the endpoints in the tidal segments of the Anacostia River. Initial reductions were applied throughout the watershed in LSPC as follows:

1. Individually permitted point source discharges were, in most cases, set to criteria concentrations (see Section 3.2.1 for more information on point sources).
2. Watershed loading was reduced using a top-down approach targeting the farthest upstream subwatersheds first. Once instream water quality targets were met in those watersheds, the subwatersheds directly downstream were then reduced until targets were met in all subwatersheds.

3. Instream water quality concentrations were compared against the endpoints at the model reach pour point.
4. Watershed loadings were reduced on a land use basis. In each subbasin, all urban land uses were assigned equal percent load reductions up to a threshold of 99.9%. If this was not sufficient to meet the endpoint, then all agricultural land uses in the subbasin were reduced equally until the water quality target was met.
5. After the above subbasin watershed reductions were implemented in the model, if there were still areas not meeting the endpoints, then bed sediment toxic pollutant concentrations were reduced universally for the tidal mainstem to estimate the post-TMDL bed sediment toxic pollutant concentrations.

Initial watershed reductions in EFDC did not show water quality meeting the endpoints in the tidal segments of the Anacostia River; there were exceedances of the TMDL endpoints in most tidal segments of the river.

Further analysis of flow and rainfall conditions associated with model results showed that simulated water column concentrations in the tidal segments exceeded the endpoints during both wet and dry conditions. Further, these analyses demonstrated that upstream watershed loads were driving non-compliance during wet, high flow periods, whereas pollutant fluxes from the bed sediments to the water column and decreased flushing were driving non-compliance during dry, low flow conditions. Therefore, additional reductions were required to meet the TMDL endpoints. A methodology was developed and implemented to achieve additional watershed reductions to ensure the endpoints in the tidal segments were met during wet, high flow periods and simulated reductions to bed sediment in the tidal segments were made to ensure the endpoints were achieved during dry, low flow periods. This methodology for additional watershed reductions in LSPC was implemented as follows:

1. Load reductions from individually NPDES-permitted process water facilities were kept at the same level as previously determined in the initial round of reductions (i.e., no further reductions to these sources).
2. The same land uses, which had loads reduced during round one, were then targeted for additional load reductions. Additional reductions were applied based on available capacity remaining after the first round of reductions. For example, if the load reduction to a land use was 85% in the first round and an additional 50% load reduction was required on the remaining load to meet the WQC in the tidal portion of the Anacostia during wet periods, then the new reduction applied was 92.5% (0.85 + (1-0.85) * 0.50 = 0.925).
3. First, the urban land use load reductions were maximized by applying the additional reductions equally to all the urban land uses targeted in the first round.
4. If maximizing urban land use load reductions was not sufficient, then agricultural land uses targeted for reduction in the first round were further reduced. Dieldrin, PAH 2, and PAH 3 required further agricultural land use reductions. Dieldrin reductions also required that additional agricultural areas not targeted in the previous round be targeted.
5. The reduced LSPC loads were evaluated in the EFDC model to ensure endpoint attainment during wet conditions.

Once the watershed reductions were sufficient to achieve the TMDL endpoints in the tidal segments during all periods of high flow, a complementary exercise was completed to identify bed sediment concentrations which would result in achievement of the TMDL endpoints in tidal segments during dry, low flow conditions. Bed sediments contain elevated concentrations of toxic pollutants addressed in this

TMDL, and they act as a pathway of pollutants to the overlying water column during dry periods. To address this, estimated reductions to bed sediment concentrations of pollutants that did not meet the TMDL endpoints with watershed reductions alone were calculated.

Once the watershed and estimated bed sediment load reductions were sufficient to achieve the TMDL endpoints throughout the entire system, a final analysis was completed to estimate the time needed for the prescribed watershed load reductions (and other instream processes) to result in future bed sediment conditions that achieve the TMDL endpoints via natural attenuation. See Section 5.4 for additional information on natural attenuation estimates.

To confirm that the TMDL scenario would result in attaining the TMDL endpoints, the models were run with the TMDL scenario as the starting condition and the model outputs were checked at 15 locations throughout the watershed, comprising the pour point of each subwatershed in the non-tidal areas and representative cell clusters in the tidal areas. These 15 areas are referred to as verification units. Figure 5.1 illustrates the location of each verification unit throughout the watershed. The results of the verification analysis indicated that the TMDL endpoint for each of the toxic pollutants was achieved at each of the 15 verification units in the TMDL scenario. The TMDL Modeling Report (Tetra Tech, 2023b) provides figures which illustrate the results graphically.

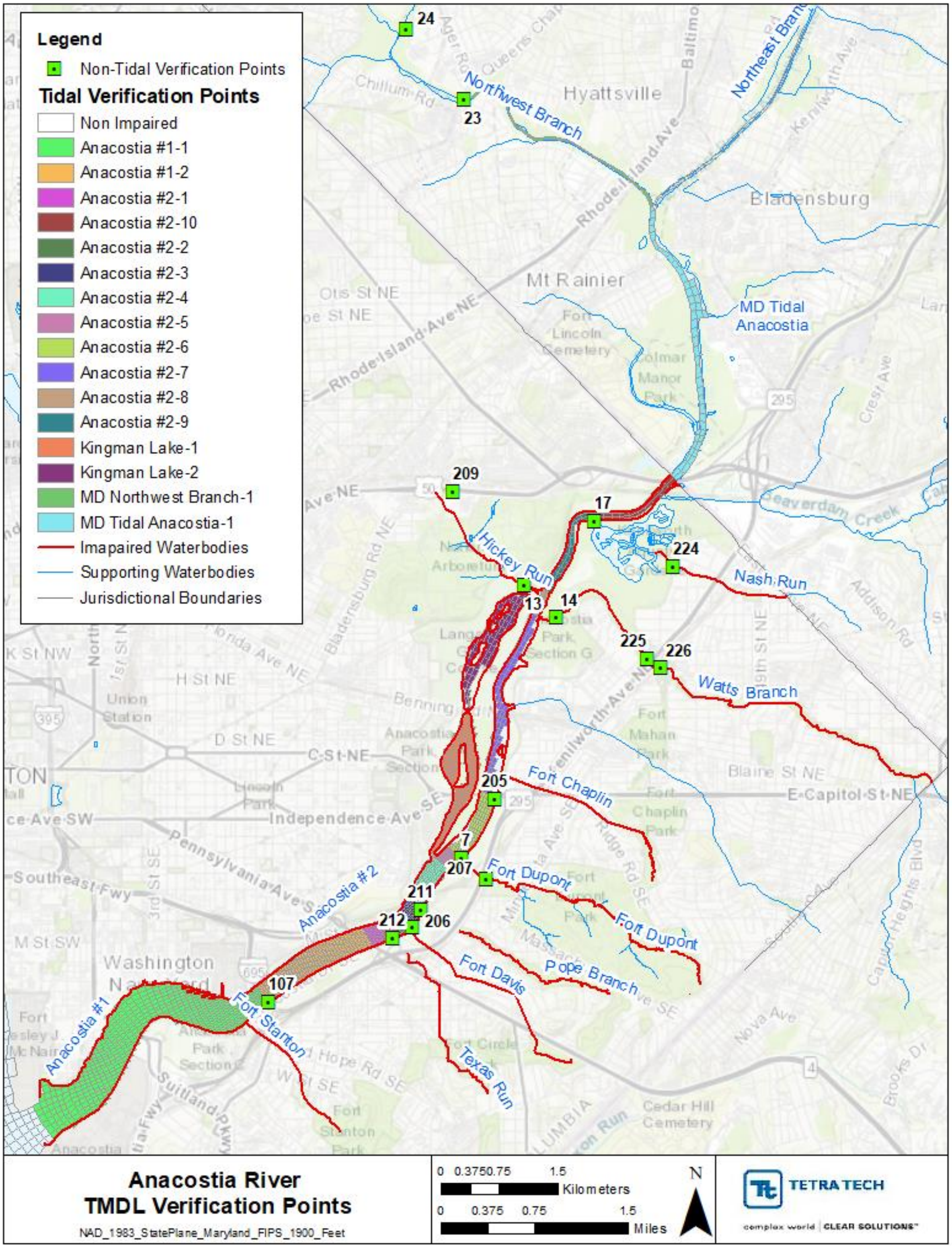

Figure 5-1 Anacostia River TMDL Verification Units

5.4 Natural Attenuation Estimates

Given that these TMDLs call for significant pollutant reductions from a number of toxic sources within the watershed and because a number of these legacy pollutants such as chlordane, dieldrin, DDT and its metabolites, and heptachlor epoxide are banned and therefore are no longer actively applied within the watershed legally, it is reasonable to expect that the concentrations of the TMDL pollutants will decline in the environment over time through natural attenuation. A decline in soil concentrations over time will lead to lower water concentrations (dissolved and particulate fractions) in waterbodies. Instream processes such as burial of contaminated sediments with newer, less contaminated material, scour and export of sediments during periods of high stream flow, and natural degradation will also contribute to the decline of these pollutants over time. These processes occur naturally within the environment. However, natural attenuation often requires decades before a significant improvement is observable.

As introduced in Section 5.3 above, natural attenuation was incorporated in the TMDL scenario as a TMDL assumption. As load reductions to nonpoint and point sources in the watershed are implemented, the net decrease in toxic pollutants in runoff and other discharges to the Anacostia River will result in the decrease of toxic pollutant concentrations in the water column and sediment, allowing the process of natural attenuation to occur. Due to the effects of contaminant flux from bed sediments to the overlying water column in the TMDL scenario, it is expected that, over time, clean sediments from the watershed following source reduction will cover the contaminated sediment and eliminate the contaminant flux. Therefore, allowing for the attainment of TMDL endpoints in the water column. A methodology was developed to use changes in bed sediment concentrations during the 4-year model simulation period to extrapolate and predict bed sediment concentrations over time and identify the length of time that it will take, after the load reductions are implemented, for natural attenuation to result in the attainment of the TMDL endpoints. Table 5.1 provides the estimated timelines for natural attenuation to result in attainment of the TMDL endpoints after the TMDL scenario is implemented. The estimated timelines for natural attenuation vary based on location in the watershed and pollutant. Generally, the analysis suggests that natural attenuation occurs quickest at the Anacostia #2-8 verification unit. In addition, natural attenuation is estimated to occur more quickly at the upstream most Anacostia mainstem verification units and slowest in the lower segment of Kingman Lake. Some factors that explain this variation include existing bed sediment pollutant concentrations (i.e., levels of contamination) and other physical factors that impact flushing (e.g., river morphology, discharge, water velocity, etc.). This analysis demonstrated that the load reductions expressed in the TMDL will ultimately result in reduction of contaminant flux from the bottom sediment and attainment of TMDL endpoints.

In addition to the process of natural attenuation, remediation of contaminated sediments (i.e., dredging, capping, carbon amendments) can reduce the concentrations of these legacy pollutants in the water column resulting from resuspension and diffusion of contaminants in the bed sediments. Nothing in these TMDLs precludes the use of dredging or other remediation efforts as a tools to achieve TMDL endpoints; consequently, these TMDLs are not inconsistent with sediment remediation efforts of the ARSP. In fact, it is reasonable to expect instream remediation efforts will decrease the amount of time it takes for water quality to approach the TMDL endpoints. While sediment removal is not an assumption or requirement of the TMDLs, the TMDLs provide further support for the need for the ARSP. This TMDL effort is unique in that a separate yet concurrent process to remediate contaminated sediment in the tidal Anacostia River is ongoing under the ARSP (see Section 9.2). The ARSP will initially implement sediment remediation efforts in certain toxic pollutant hotspots. These efforts will aid TMDL implementation and make progress towards achieving and maintaining applicable WQS.

Table 5-1 Attenuation Timeline Estimates for Each Pollutant and Tidal Verification Unit

	Attenuation Years						
Verification unit	**Heptachlor epoxide**	**Chlordane**	**Dieldrin**	**DDT**	**Arsenic**	**PAH2**	**PAH3**
Anacostia #1-1	36	49	73	77	82	78	74
Anacostia #1-2	23	34	38	57	46	49	50
Anacostia #2-1	42	62	59	67	66	68	69
Anacostia #2-2	21	25	45	40	53	46	44
Anacostia #2-3	15	21	20	25	31	32	32
Anacostia #2-4	15	28	41	37	34	34	32
Anacostia #2-5	13	25	29	25	27	31	30
Anacostia #2-6	17	22	20	29	34	26	27
Anacostia #2-7	6	15	12	17	16	17	17
Anacostia #2-8	5	9	10	8	9	9	9
Anacostia #2-9	7	13	9	14	12	14	15
Anacostia #2-10	4	10	11	17	12	12	12
Kingman Lake-1	111	117	151	175	206	199	210
Kingman Lake-2	7	17	19	17	25	23	24

5.5 Daily Load Methodology

In November 2006, EPA released the memorandum *Establishing TMDL Daily Loads in Light of the Decision by the U.S. Court of Appeals for the D.C. Circuit in Friends of the Earth, Inc. v. EPA et. al., No. 05-5015 (April 25, 2006) and Implications for NPDES permits*, which recommends that all TMDLs and associated LAs and WLAs include a daily time increment in conjunction with other appropriate temporal expressions that might be necessary to implement the relevant WQS. Therefore, this report presents daily load expressions (i.e., TMDLs) in addition to annual load allocations for the Anacostia River, its tributaries, and Kingman Lake.

Daily loads were developed in a manner consistent with Section 303(d) of the CWA, EPA's implementing regulations at 40 C.F.R. § 130.7, and the 2006 Daily Loads Memorandum (U.S. EPA, 2006). Daily loads were calculated using the LSPC model's reach output, which contains a time series for each of the watersheds that drain into the impaired segments. Specifically, daily flow and concentration time series data from the most downstream pour point of the impaired segments were extracted for each of the seven toxic pollutants. The loading of the toxic pollutant from the reach is subject to various transformation processes after it reaches the water from the watershed. Refer to the TMDL Modeling Report (Tetra Tech, 2023b) for more information. For each of the impaired segments, a total daily load was calculated for each day of the TMDL allocation scenario across the four-year simulation period, and then the highest daily load was selected as the maximum daily load for that impaired segment.

Ratios of the annual average aggregate LAs and aggregate WLAs were used to parse the maximum daily load into aggregate LAs and aggregate WLAs for each impaired segment. The maximum daily aggregate LAs and aggregate WLAs for each impaired segment were then further divided to provide individual daily

LAs and WLAs for each source in each impaired segment. The ratio of the individual annual average load for each of the various source categories was calculated and then multiplied by the maximum daily load to further parse the load for each impaired segment. For example, the ratio of the annual average LA for CSX and the total annual average LA for the system was calculated and multiplied by the maximum daily LA to derive the maximum daily LA for CSX. Providing individual daily WLAs to sources is a revision from the earlier draft of the TMDLs that was released for public notice and comment in 2021.

6 ALLOCATIONS

The TMDLs for the Anacostia River, its tributaries, and Kingman Lake cover 13 impaired waterbody segments and up to seven impairing toxic pollutants for each waterbody segment. This results in a total of 48 TMDLs established for impaired waterbody-pollutant combinations in the Anacostia River, its tributaries, and Kingman Lake. The remaining 72 waterbody-pollutant combinations are provided informational TMDLs in Appendix A as these waterbody-pollutant combinations are not listed as impaired on DOEE's IR. Table 6-1 summarizes the Anacostia River WLAs, LAs, and TMDLs for the seven toxic pollutants for the Anacostia River. Table 6-2 summarizes the cumulative annual baseline load, load reduction, annual WLAs, annual LAs, and annual loads for the seven toxic pollutants for the Anacostia River.

Table 6-1 Anacostia River TMDLs[1]

Pollutant	WLA (g/day)	LA (g/day)	Upstream Load (g/day)	Cumulative[2] TMDL (g/day)
Arsenic	2122.91	51.31	5740.27	7914.48
Chlordane	7.22	0.12	20.34	27.67
DDT	0.37	0.02	1.01	1.40
Dieldrin	0.004	0	0.01	0.014
Heptachlor epoxide	0.98	0.02	2.67	3.67
PAH 2	1.12	0.01	3.13	4.25
PAH 3	0.12	0	0.32	0.44

[1]The MOS is implicit.

[2]Cumulative daily load allocations from the downstream most segment of the Anacostia River (Anacostia #1).

Table 6-2 Summary of Annual Baseline Load, Load Reduction, and Anacostia River Annual Loads[1]

Pollutant	Baseline Load (g/year)	Load Reduction (%)	WLA (g/year)	LA (g/year)	Upstream Load (g/year)	Cumulative[2] Annual Load Allocation (g/year)
Arsenic	271,072	96.76	556.47	7.89	8229.77	8794.13
Chlordane	1904	98.34	1.77	0.08	29.73	31.59
DDT	135	98.89	0.09	0.03	1.38	1.5
Dieldrin	412	100	0.002	0	0.005	0.007

Heptachlor epoxide	339	98.99	0.21	0.01	3.22	3.44
PAH 2	59478.31	99.99	2.22	0	5.95	8.17
PAH 3	48985.93	100	0.22	0	0.63	0.85

[1]The MOS is implicit.

[2]Cumulative annual load allocations from the downstream most segment of the Anacostia River (Anacostia #1).

TMDL load allocations are expressed in three ways for each toxic pollutant. The tables that follow in Sections 6.3, 6.4, 6.5, 6.6, and Appendix A include the same information, structure, and organization for each of the toxic pollutants.

- In Section 6.3, Tables 6-3 through 6-9 show total maximum daily load allocations. In the TMDL allocation tables, the Contaminated Site LA and the MSGP WLA are collapsed into one row for simplicity.
- In Section 6.4, Tables 6-10 through 6-16 show annual load allocations for each impaired waterbody-pollutant combination. In the annual allocation tables, the Contaminated Site LA and the MSGP WLA are collapsed into one row for simplicity.
- In Section 6.5, the Contaminated Site LA is expanded to provide individual LAs for each of the 12 contaminated sites.
- Similarly, in Section 6.6, the MSGP WLA is expanded to provide individual WLAs for each of the 16 MSGP facilities.
- Finally, Appendix A includes a set of tables that provide informational TMDLs for the unimpaired waterbody-pollutant combinations. Appendix A includes informational total maximum daily load allocations, annual load allocations, individual contaminated site LAs, and individual MSGP WLAs for unimpaired waterbody-pollutant combinations.

These allocations may be revised among different sources if necessary to achieve WQS for the Anacostia River watershed.

6.1 Wasteload Allocation

The wasteload allocation (WLA) portion of the TMDL includes permitted point sources. This includes the CSS, MS4, facilities covered under the MSGP for stormwater, and four individual NPDES permitted facilities: DC Water Outfall 019 (DC0021199), Super Concrete (DC0000175), WNY (DC0000141), and PEPCO (DC0000094). Aside from having individual NPDES permits, WNY and PEPCO are also considered contaminated sites with completed or ongoing clean-up investigations for legacy contamination, and so their loads include both the land-based loads attributed to the contaminated land and the loads attributed to their NPDES-regulated discharges. Like the other individual NPDES permitted facilities, the WLAs for their NPDES discharges are set at criteria concentrations and do not require reductions. However, their land based loads do require reductions as part of the nonpoint source load allocation.

6.2 Load Allocation

The load allocation (LA) portion of the TMDL is representative of nonpoint sources of contaminants. In the District, the LA includes a group of known contaminated sites: CSX, Firth Sterling Steel, Former Hess Petroleum Terminal, Former Steuart Petroleum, Fort McNair, Joint Base Anacostia-Bolling (JBAB), JBAB AOC 1, JBAB Site 2, JBAB Site 3, Kenilworth Park Landfill North, Kenilworth Park Landfill South, Poplar Point, Southeast Federal Center, and Washington Gas. Within the District, an LA is also included for the upstream loads of toxic pollutants originating in Maryland. Non-regulated stormwater runoff is not included as a nonpoint source in DC as all other watershed runoff is incorporated into the stormwater loads associated with the MS4, CSS, or MSGP.

6.3 Total Maximum Daily Load Tables

Table 6-3 TMDLs for Arsenic

Segment	Source	TMDL (g/day)
Nash Run	MD Upstream Load[1]	3.73
	Contaminated Sites	0.24
	Nonpoint Sources/LAs	**3.96**
	MS4	6.86
	Point Sources/WLAs	**6.86**
	Total Nash Run	**10.82**
Watts Branch[2]	MD Upstream Load[1]	21.60
	Contaminated Sites	0.21
	Nonpoint Sources/LAs	**21.82**
	MS4	14.50
	Pepco (DC0000094)[3]	0.09
	Point Sources/WLAs	**14.59**
	Total Watts Branch	**36.40**
Kingman Lake[4]	MS4	14.16
	Point Sources/WLAs	**14.16**
	Total Kingman Lake	**14.16**
Fort Chaplin Run[4]	MS4	6.17
	Point Sources/WLAs	**6.17**
	Total Fort Chaplin Run	**6.17**
Fort Dupont Creek	Contaminated Sites	0.18
	Nonpoint Sources/LAs	**0.18**
	MS4	12.19
	Point Sources/WLAs	**12.19**
	Total Fort Dupont Creek	**12.37**
Fort Davis Tributary[4]	MS4	4.90
	Point Sources/WLAs	**4.90**
	Total Fort Davis Tributary	**4.90**
Texas Avenue Tributary[4]	MS4	5.17
	Point Sources/WLAs	**5.17**
	Total Texas Avenue Tributary	**5.17**
Anacostia #2[5]	Upstream Loads	
	MD Upstream Load[6]	5053.08
	DC Point Source	
	Super Concrete (DC0000175)[7]	24.22

	Cumulative Load from Tributaries	74.19
	Load from Kingman Lake	14.16
	Cumulative Upstream Load	**5141.42**
	Anacostia #2 Direct Drainage	
	Contaminated Sites	6.78
	Nonpoint Sources/LAs	**6.78**
	Anacostia #2 Direct Drainage	
	MS4	568.24
	MSGP	10.18
	Pepco (DC0000094)[3]	10.26
	Point Sources/WLAs	**588.68**
	Total Anacostia #2	**5736.88**
Fort Stanton Tributary[4]	MS4	3.39
	Point Sources/WLAs	**3.39**
	Total Fort Stanton Tributary	**3.39**
Anacostia #1[8]	Upstream Loads	
	Cumulative Load from Anacostia #2	5736.88
	Cumulative Load from Tributaries	3.39
	Cumulative Upstream Load	**5740.27**
	Anacostia #1 Direct Drainage	
	Contaminated Sites	51.31
	Nonpoint Sources/LAs	**51.31**
	Anacostia #1 Direct Drainage	
	CSS	361.01
	MS4	817.90
	MSGP	19.01
	DC Water Outfall 019 (DC0021199)	912.39
	Washington Navy Yard (DC0000141)[3]	12.59
	Point Sources/WLAs	**2122.91**
	Total Anacostia #1	**7914.48**

[1]Upstream loads from the MD portion of the watershed.
[2]DC delineates Watts Branch as two assessment units, but for the purposes of this TMDL, Watts Branch #1 and #2 were combined.
[3]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.
[4]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
[5]Loads presented for the Anacostia #2 segment are cumulative. The loads for Anacostia #2 include loads from MD Anacostia Tidal Segment, Kingman Lake, tributaries to Anacostia #2, and direct drainage.
[6]Upstream loads from MD include loads from the MD Anacostia Tidal Segment watershed comprising the Northeast Branch, Northwest Branch, and direct drainage to the MD Anacostia Tidal Segment, as well as upstream loads from the MD portion of the Lower Beaverdam Creek, Watts Branch, and Nash Run which drain directly to DC waters.

[7]The WLA for Super Concrete (DC0000175), a DC NPDES point source, is presented as a component of the MD Upstream Load because its discharge enters an unnamed tributary in DC which then flows eastward across the DC/MD boundary and ultimately drains into the MD Northwest Branch. This WLA was inadvertently omitted from the allocation tables in earlier drafts of the TMDL Report but was reflected in the cumulative loads entering the Anacostia River mainstem in DC and individually in the TMDL allocation spreadsheets found in the Supporting Documents. The methodology to calculate the WLA for Super Concrete was described in earlier drafts of the TMDL Report and remains the same.
[8]Loads presented for the Anacostia #1 segment are cumulative. The loads for Anacostia #1 include cumulative loads from Anacostia #2, tributaries to Anacostia #1, and direct drainage.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table 6-4 TMDLs for Chlordane

Segment	Source	TMDL (g/day)
Kingman Lake[1]	MS4	0.023
	Point Sources/WLAs	**0.023**
	Total Kingman Lake	**0.023**
Popes Branch[1]	DC MS4	0.010
	Point Sources/WLAs	**0.010**
	Total Popes Branch	**0.010**
Texas Avenue Tributary[1]	MS4	0.010
	Point Sources/WLAs	**0.010**
	Total Texas Avenue Tributary	**0.010**
Anacostia #1[2]	Upstream Loads	
	Cumulative Load from Anacostia #2	20.336
	Cumulative Load from Tributaries	0.005
	Cumulative Upstream Load	**20.342**
	Anacostia #1 Direct Drainage	
	Contaminated Sites	0.116
	Nonpoint Sources/LAs	**0.116**
	Anacostia #1 Direct Drainage	
	CSS	1.6224
	MS4	3.137
	MSGP	0.110
	DC Water Outfall 019 (DC0021199)	2.227
	Washington Navy Yard (DC0000141)[3]	0.122
	Point Sources/WLAs	**7.2183**
	Total Anacostia #1	**27.6761**

[1]No LA is presented for these segments because all stormwater runoff is captured by the MS4.

[2]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.
[3]Loads presented for the Anacostia #1 segment are cumulative. The loads for Anacostia #1 include cumulative loads from Anacostia #2, tributaries to Anacostia #1, and direct drainage.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table 6-5 TMDLs for DDT and its Metabolites

Segment	Source	TMDL (g/day)
Hickey Run[1]	MS4	0.0033
	MSGP	0.0002
	Point Sources/WLAs	**0.0035**
	Total Hickey Run	**0.0035**
Kingman Lake[1]	MS4	2.00E-03
	Point Sources/WLAs	**2.00E-03**
	Total Kingman Lake	**2.00E-03**
Popes Branch[1]	MS4	7.87E-04
	Point Sources/WLAs	**7.87E-04**
	Total Popes Branch	**7.87E-04**
Texas Avenue Tributary[1]	MS4	7.44E-04
	Point Sources/WLAs	**7.44E-04**
	Total Texas Avenue Tributary	**7.44E-04**
Anacostia #2[2]	Upstream Loads	
	MD Upstream Load[3]	0.8526
	DC Point Source	
	Super Concrete (DC0000175)[4]	0.0027
	Cumulative Load from Tributaries	0.0180
	Load from Kingman Lake	0.0020
	Cumulative Upstream Load	**0.8727**
	Anacostia #2 Direct Drainage	
	Contaminated Sites	0.0064
	Nonpoint Sources/LAs	**0.0064**
	Anacostia #2 Direct Drainage	
	MS4	0.1247
	MSGP	0.0017
	Pepco (DC0000094)[5]	0.0080
	Point Sources/WLAs	**0.1345**
	Total Anacostia #2	**1.0135**
Anacostia #1[6]	Upstream Loads	
	Cumulative Load from Anacostia #2	1.0135

	Cumulative Load from Tributaries	4.12E-04
	Cumulative Upstream Load	**1.0139**
	Anacostia #1 Direct Drainage	
	Contaminated Sites	0.0161
	Nonpoint Sources/LAs	**0.0161**
	Anacostia #1 Direct Drainage	
	CSS	0.0686
	MS4	0.1431
	MSGP	0.0037
	DC Water Outfall 019 (DC0021199)	0.1266
	Washington Navy Yard (DC0000141)[5]	0.0309
	Point Sources/WLAs	**0.3729**
	Total Anacostia #1	**1.4030**

[1]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
[2]Loads presented for the Anacostia #2 segment are cumulative. The loads for Anacostia #2 include loads from MD Anacostia Tidal Segment, Kingman Lake, tributaries to Anacostia #2, and direct drainage.
[3]Upstream loads from MD include loads from the MD Anacostia Tidal Segment watershed comprising the Northeast Branch, Northwest Branch, and direct drainage to the MD Anacostia Tidal Segment, as well as upstream loads from the MD portion of the Lower Beaverdam Creek, Watts Branch, and Nash Run which drain directly to DC waters.
[4]The WLA for Super Concrete (DC0000175), a DC NPDES point source, is presented as a component of the MD Upstream Load because its discharge enters an unnamed tributary in DC which then flows eastward across the DC/MD boundary and ultimately drains into the MD Northwest Branch. This WLA was inadvertently omitted from the allocation tables in earlier drafts of the TMDL Report but was reflected in the cumulative loads entering the Anacostia River mainstem in DC and individually in the TMDL allocation spreadsheets found in the Supporting Documents. The methodology to calculate the WLA for Super Concrete was described in earlier drafts of the TMDL Report and remains the same.
[5]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.
[6]Loads presented for the Anacostia #1 segment are cumulative. The loads for Anacostia #1 include cumulative loads from Anacostia #2, tributaries to Anacostia #1, and direct drainage.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table 6-6 TMDLs for Dieldrin

Segment	Source	TMDL (g/day)
Nash Run	MD Upstream Load[1]	0
	Contaminated Sites	0
	Nonpoint Sources/LAs	**0**

	MS4	0
	Point Sources/WLAs	**0**
	Total Nash Run	**0**
Watts Branch[2]	MD Upstream Load[1]	**5.04E-05**
	Contaminated Sites	0
	Nonpoint Sources/LAs	**5.04E-05**
	MS4	0
	Pepco (DC0000094)[3]	0
	Point Sources/WLAs	**0**
	Total Watts Branch	**5.04E-05**
Kingman Lake[4]	MS4	0
	Point Sources/WLAs	**0**
	Total Kingman Lake	**0**
Popes Branch[4]	MS4	0
	Point Sources/WLAs	**0**
	Total Popes Branch	**0**
Texas Avenue Tributary[4]	MS4	0
	Point Sources/WLAs	**0**
	Total Texas Avenue Tributary	**0**
Anacostia #2[5]	Upstream Loads	
	MD Upstream Load[6]	1.00E-02
	DC Point Source	
	Super Concrete (DC0000175)[7]	3.92E-04
	Cumulative Load from Tributaries	0
	Load from Kingman Lake	0
	Cumulative Upstream Load	**1.00E-02**
	Anacostia #2 Direct Drainage	
	Contaminated Sites	0
	Nonpoint Sources/LAs	**0**
	Anacostia #2 Direct Drainage	
	MS4	0
	MSGP	0
	Pepco (DC0000094)[3]	0
	Point Sources/WLAs	**0**
	Total Anacostia #2	**1.00E-02**
Anacostia #1[8]	Upstream Loads	
	Cumulative Load from Anacostia #2	1.00E-02
	Cumulative Load from Tributaries	0
	Cumulative Upstream Load	**1.00E-02**
	Anacostia #1 Direct Drainage	
	Contaminated Sites	0

	Nonpoint Sources/LAs	**0**
	Anacostia #1 Direct Drainage	
	CSS	0
	MS4	0
	MSGP	0
	DC Water Outfall 019 (DC0021199)	3.50E-03
	Washington Navy Yard (DC0000141)[3]	0
	Point Sources/WLAs	**3.50E-03**
	Total Anacostia #1	**1.35E-02**

[1]Upstream loads from the MD portion of the watershed.
[2]DC delineates Watts Branch as two assessment units, but for the purposes of this TMDL, Watts Branch #1 and #2 were combined.
[3]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.
[4]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
[5]Loads presented for the Anacostia #2 segment are cumulative. The loads for Anacostia #2 include loads from MD Anacostia Tidal Segment, Kingman Lake, tributaries to Anacostia #2, and direct drainage.
[6]Upstream loads from MD include loads from the MD Anacostia Tidal Segment watershed comprising the Northeast Branch, Northwest Branch, and direct drainage to the MD Anacostia Tidal Segment, as well as upstream loads from the MD portion of the Lower Beaverdam Creek, Watts Branch, and Nash Run which drain directly to DC waters.
[7]The WLA for Super Concrete (DC0000175), a DC NPDES point source, is presented as a component of the MD Upstream Load because its discharge enters an unnamed tributary in DC which then flows eastward across the DC/MD boundary and ultimately drains into the MD Northwest Branch. This WLA was inadvertently omitted from the allocation tables in earlier drafts of the TMDL Report but was reflected in the cumulative loads entering the Anacostia River mainstem in DC and individually in the TMDL allocation spreadsheets found in the Supporting Documents. The methodology to calculate the WLA for Super Concrete was described in earlier drafts of the TMDL Report and remains the same.
[8]Loads presented for the Anacostia #1 segment are cumulative. The loads for Anacostia #1 include cumulative loads from Anacostia #2, tributaries to Anacostia #1, and direct drainage.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table 6-7 TMDLs for Heptachlor Epoxide

Segment	**Source**	**TMDL (g/day)**
Nash Run	MD Upstream Load[1]	1.82E-03
	Contaminated Sites	2.64E-04
	Nonpoint Sources/LAs	**2.08E-03**
	MS4	3.43E-03
	Point Sources/WLAs	**3.43E-03**

	Total Nash Run	**5.51E-03**
Popes Branch[2]	MS4	2.16E-03
	Point Sources/WLAs	**2.16E-03**
	Total Popes Branch	**2.16E-03**
Texas Avenue Tributary[2]	MS4	2.08E-03
	Point Sources/WLAs	**2.08E-03**
	Total Texas Avenue Tributary	**2.08E-03**
Anacostia #2[3]	Upstream Loads	
	MD Upstream Load[4]	2.32E+00
	DC Point Source	
	Super Concrete (DC0000175)[5]	5.83E-03
	Cumulative Load from Tributaries	3.34E-02
	Load from Kingman Lake	4.53E-03
	Cumulative Upstream Load	**2.35E+00**
	Anacostia #2 Direct Drainage	
	Contaminated Sites	4.07E-03
	Nonpoint Sources/LAs	**4.07E-03**
	Anacostia #2 Direct Drainage	
	MS4	3.01E-01
	MSGP	6.14E-03
	Pepco (DC0000094)[6]	7.89E-03
	Point Sources/WLAs	**3.15E-01**
	Total Anacostia #2	**2.67E+00**
Anacostia #1[7]	Upstream Loads	
	Cumulative Load from Anacostia #2	2.67E+00
	Cumulative Load from Tributaries	1.46E-03
	Cumulative Upstream Load	**2.67E+00**
	Anacostia #1 Direct Drainage	
	Contaminated Sites	1.59E-02
	Nonpoint Sources/LAs	**1.59E-02**
	Anacostia #1 Direct Drainage	
	CSS	2.17E-01
	MS4	4.77E-01
	MSGP	1.20E-02
	DC Water Outfall 019 (DC0021199)	2.53E-01
	Washington Navy Yard (DC0000141)[6]	2.08E-02
	Point Sources/WLAs	**9.80E-01**
	Total Anacostia #1	**3.67E+00**

[1]Upstream loads from the MD portion of the watershed.
[2]No LA is presented for these segments because all stormwater runoff is captured by the MS4.

[3]Loads presented for the Anacostia #2 segment are cumulative. The loads for Anacostia #2 include loads from the MD Anacostia Tidal Segment, Kingman Lake, tributaries to Anacostia #2, and direct drainage.
[4]Upstream loads from MD include loads from the MD Anacostia Tidal Segment watershed comprising the Northeast Branch, Northwest Branch, and direct drainage to the MD Anacostia Tidal Segment as well as upstream loads from the MD portion of the Lower Beaverdam Creek, Watts Branch, and Nash Run which drain directly to DC waters.
[5]The WLA for Super Concrete (DC0000175), a DC NPDES point source, is presented as a component of the MD Upstream Load because its discharge enters an unnamed tributary in DC which then flows eastward across the DC/MD boundary and ultimately drains into the MD Northwest Branch. This WLA was inadvertently omitted from the allocation tables in earlier drafts of the TMDL Report but was reflected in the cumulative loads entering the Anacostia River mainstem in DC and individually in the TMDL allocation spreadsheets found in the Supporting Documents. The methodology to calculate the WLA for Super Concrete was described in earlier drafts of the TMDL Report and remains the same.
[6]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.
[7]Loads presented for the Anacostia #1 segment are cumulative. The loads for Anacostia #1 include cumulative loads from Anacostia #2, tributaries to Anacostia #1, and direct drainage.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table 6-8 TMDLs for the PAH 2 Group

Segment	Source	TMDL (g/day)
Nash Run	MD Upstream Load[1]	0
	Contaminated Sites	0
	Nonpoint Sources/LAs	**0**
	MS4	0
	Point Sources/WLAs	**0**
	Total Nash Run	**0**
Hickey Run[2]	MS4	0
	MSGP	0
	Point Sources/WLAs	**0**
	Total Hickey Run	**0**
Kingman Lake[2]	MS4	0
	Point Sources/WLAs	**0**
	Total Kingman Lake	**0**
Popes Branch[2]	DC MS4	0
	Point Sources/WLAs	**0**
	Total Popes Branch	**0**
Texas Avenue Tributary[2]	MS4	0
	Point Sources/WLAs	**0**

	Total Texas Avenue Tributary	**0**
Anacostia #2[3]	Upstream Loads	
	MD Upstream Load[4]	2.84
	DC Point Source	
	Super Concrete (DC0000175)[5]	0.14
	Cumulative Load from Tributaries	0
	Load from Kingman Lake	0
	Cumulative Upstream Load	**2.84**
	Anacostia #2 Direct Drainage	
	Contaminated Sites	0
	Nonpoint Sources/LAs	**0**
	Anacostia #2 Direct Drainage	
	MS4	0
	MSGP	0
	Pepco (DC0000094)[6]	0.28
	Point Sources/WLAs	**0.28**
	Total Anacostia #2	**3.13**
Fort Stanton Tributary[2]	MS4	0
	Point Sources/WLAs	**0**
	Total Fort Stanton Tributary	**0**
Anacostia #1[7]	Upstream Loads	
	Cumulative Load from Anacostia #2	3.13
	Cumulative Load from Tributaries	0
	Cumulative Upstream Load	**3.13**
	Anacostia #1 Direct Drainage	
	Contaminated Sites	0
	Nonpoint Sources/LAs	**0**
	Anacostia #1 Direct Drainage	
	CSS	0
	MS4	0
	MSGP	0
	DC Water Outfall 019 (DC0021199)	1.12
	Washington Navy Yard (DC0000141)[6]	0
	Point Sources/WLAs	**1.12**
	Total Anacostia #1	**4.25**

[1]Upstream loads from the MD portion of the watershed.
[2]No LA is given for these segments because all stormwater runoff is captured by the MS4.
[3]Loads presented for the Anacostia #2 segment are cumulative. The loads for Anacostia #2 include loads from MD Anacostia Tidal Segment, Kingman Lake, tributaries to Anacostia #2, and direct drainage.

[4]Upstream loads from MD include loads from the MD Anacostia Tidal Segment watershed comprising the Northeast Branch, Northwest Branch, and direct drainage to the MD Anacostia Tidal Segment, as well as upstream loads from the MD portion of the Lower Beaverdam Creek, Watts Branch, and Nash Run which drain directly to DC waters.
[5]The WLA for Super Concrete (DC0000175), a DC NPDES point source, is presented as a component of the MD Upstream Load because its discharge enters an unnamed tributary in DC which then flows eastward across the DC/MD boundary and ultimately drains into the MD Northwest Branch. This WLA was inadvertently omitted from the allocation tables in earlier drafts of the TMDL Report but was reflected in the cumulative loads entering the Anacostia River mainstem in DC and individually in the TMDL allocation spreadsheets found in the Supporting Documents. The methodology to calculate the WLA for Super Concrete was described in earlier drafts of the TMDL Report and remains the same.
[6]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.
[7]Loads presented for the Anacostia #1 segment are cumulative. The loads for Anacostia #1 include cumulative loads from Anacostia #2, tributaries to Anacostia #1, and direct drainage.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table 6-9 TMDLs for the PAH 3 Group

Segment	Source	TMDL (g/day)
Nash Run	MD Upstream Load[1]	0
	Contaminated Sites	0
	Nonpoint Sources/LAs	**0**
	MS4	0
	Point Sources/WLAs	**0**
	Total Nash Run	**0**
Hickey Run[2]	MS4	0
	MSGP	0
	Point Sources/WLAs	**0**
	Total Hickey Run	**0**
Kingman Lake[2]	MS4	0
	Point Sources/WLAs	**0**
	Total Kingman Lake	**0**
Popes Branch[2]	MS4	0
	Point Sources/WLAs	**0**
	Total Popes Branch	**0**
Texas Avenue Tributary[2]	MS4	0
	Point Sources/WLAs	**0**
	Total Texas Avenue Tributary	**0**
Anacostia #2[3]	Upstream Loads	

	MD Upstream Load[4]	0.292
	DC Point Source	
	Super Concrete (DC0000175)[5]	0.014
	Cumulative Load from Tributaries	0
	Load from Kingman Lake	0
	Cumulative Upstream Load	**0.292**
	Anacostia #2 Direct Drainage	
	Contaminated Sites	0
	Nonpoint Sources/LAs	**0**
	Anacostia #2 Direct Drainage	
	MS4	0
	MSGP	0
	Pepco (DC0000094)[6]	0.030
	Point Sources/WLAs	**0.030**
	Total Anacostia #2	**0.322**
Fort Stanton Tributary[2]	MS4	0
	Point Sources/WLAs	**0**
	Total Fort Stanton Tributary	**0**
Anacostia #1[7]	Upstream Loads	
	Cumulative Load from Anacostia #2	0.322
	Cumulative Load from Tributaries	0
	Cumulative Upstream Load	**0.322**
	Anacostia #1 Direct Drainage	
	Contaminated Sites	0
	Nonpoint Sources/LAs	**0**
	Anacostia #1 Direct Drainage	
	CSS	0
	MS4	0
	MSGP	0
	DC Water Outfall 019 (DC0021199)	0.115
	Washington Navy Yard (DC0000141)[6]	0
	Point Sources/WLAs	**0.115**
	Total Anacostia #1	**0.437**

[1]Upstream loads from the MD portion of the watershed.
[2]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
[3]Loads presented for the Anacostia #2 segment are cumulative. The loads for Anacostia #2 include loads from MD Anacostia Tidal Segment, Kingman Lake, tributaries to Anacostia #2, and direct drainage.
[4]Upstream loads from MD include loads from the MD Anacostia Tidal Segment watershed comprising the Northeast Branch, Northwest Branch, and direct drainage to the MD Anacostia Tidal Segment, as well as upstream loads from the MD portion of the Lower Beaverdam Creek, Watts Branch, and Nash Run which drain directly to DC waters.

[5]The WLA for Super Concrete (DC0000175), a DC NPDES point source, is presented as a component of the MD Upstream Load because its discharge enters an unnamed tributary in DC which then flows eastward across the DC/MD boundary and ultimately drains into the MD Northwest Branch. This WLA was inadvertently omitted from the allocation tables in earlier drafts of the TMDL Report but was reflected in the cumulative loads entering the Anacostia River mainstem in DC and individually in the TMDL allocation spreadsheets found in the Supporting Documents. The methodology to calculate the WLA for Super Concrete was described in earlier drafts of the TMDL Report and remains the same.
[6]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.
[7]Loads presented for the Anacostia #1 segment are cumulative. The loads for Anacostia #1 include cumulative loads from Anacostia #2, tributaries to Anacostia #1, and direct drainage.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

6.4 Annual Load Tables

Table 6-10 Annual Loads for Arsenic

Segment	Source	Baseline Load (g/year)	Baseline Load (%)	TMDL (g/year)	Load Reduction (%)
Nash Run	MD Upstream Load[1]	542.44	19.07	12.44	97.71
	Contaminated Sites	1171.48	41.18	0.79	99.93
	Nonpoint Sources/LAs	**1713.92**	**60.26**	**13.23**	**99.23**
	MS4	1130.53	39.74	22.92	97.97
	Point Sources/WLAs	**1130.53**	**39.74**	**22.92**	**97.97**
	Total Nash Run	**2844.45**	**100**	**36.15**	**98.73**
Watts Branch[2]	MD Upstream Load[1]	2591.50	35.20	95.55	96.31
	Contaminated Sites	1481.18	20.12	0.95	99.94
	Nonpoint Sources/LAs	**4072.68**	**55.32**	**96.50**	**97.63**
	MS4	3063.37	41.61	64.13	97.91
	Pepco (DC0000094)[3]	225.67	3.07	0.38	99.83
	Point Sources/WLAs	**3289.04**	**44.68**	**64.52**	**98.04**
	Total Watts Branch	**7361.72**	**100**	**161.01**	**97.81**
Kingman Lake[4]	MS4	1292.84	100	33.40	97.42
	Point Sources/WLAs	**1292.84**	**100**	**33.40**	**97.42**
	Total Kingman Lake	**1292.84**	**100**	**33.40**	**97.42**
Fort Chaplin Run[4]	MS4	699.53	100	18.04	97.42
	Point Sources/WLAs	**699.53**	**100**	**18.04**	**97.42**
	Total Fort Chaplin Run	**699.53**	**100**	**18.04**	**97.42**
Fort Dupont Creek	Contaminated Sites	186.31	19.14	0.32	99.83
	Nonpoint Sources/LAs	**186.31**	**19.14**	**0.32**	**99.83**

	MS4	787.14	80.86	21.73	97.24
	Point Sources/WLAs	**787.14**	**80.86**	**21.73**	**97.24**
	Total Fort Dupont Creek	**973.45**	**100**	**22.05**	**97.74**
Fort Davis Tributary[4]	MS4	530.38	100	13.61	97.01
	Point Sources/WLAs	**530.38**	**100**	**13.61**	**97.01**
	Total Fort Davis Tributary	**530.38**	**100**	**13.61**	**97.01**
Texas Avenue Tributary[4]	MS4	579.50	100	14.85	97.44
	Point Sources/WLAs	**579.50**	**100**	**14.85**	**97.44**
	Total Texas Avenue Tributary	**579.50**	**100**	**14.85**	**97.44**
Anacostia #2[5]	Upstream Loads				
	MD Upstream Load[6]	203543.57	85.52	7594.23	96.27
	DC Point Source				
	Super Concrete (DC0000175)[7]	85.09	0.04	85.09	0
	Cumulative Load from Tributaries	13371.19	5.62	235.54	98.24
	Load from Kingman Lake	1292.84	0.54	33.4	97.42
	Cumulative Upstream Load	**218207.61**	**91.68**	**7863.17**	**96.4**
	Anacostia #2 Direct Drainage				
	Contaminated Sites	3513.06	1.48	2.46	99.93
	Nonpoint Sources/LAs	**3513.06**	**1.48**	**2.46**	**99.93**
	Anacostia #2 Direct Drainage				
	MS4	14484.92	6.09	332.32	97.71
	MSGP	259.48	0.11	5.95	97.71
	Pepco (DC0000094)[3]	1533.01	0.64	6	99.61
	Point Sources/WLAs	**16277.40**	**6.84**	**344.28**	**97.88**
	Total Anacostia #2	**237998.07**	**100**	**8209.91**	**96.55**
Fort Stanton Tributary[4]	MS4	833.28	100	19.86	97.62
	Point Sources/WLAs	**833.28**	**100**	**19.86**	**97.62**
	Total Fort Stanton Tributary	**833.28**	**100**	**19.86**	**97.62**
Anacostia #1[8]	Upstream Loads				
	Cumulative Load from Anacostia #2	237998.07	87.8	8209.91	96.55
	Cumulative Load from Tributaries	833.28	0.31	19.86	97.62
	Cumulative Upstream Load	**238831.35**	**88.11**	**8229.77**	**96.55**
	Anacostia #1 Direct Drainage				
	Contaminated Sites	10837.56	4	7.89	99.93
	Nonpoint Sources/LAs	**10837.56**	**4**	**7.89**	**99.93**
	Anacostia #1 Direct Drainage				
	CSS	4335.35	1.6	94.63	97.82
	MS4	14010.41	5.17	214.39	98.47
	MSGP	228.44	0.08	4.98	97.82
	DC Water Outfall 019 (DC0021199)	239.16	0.09	239.16	0
	Washington Navy Yard (DC0000141)[3]	2590.6	0.96	3.30	99.87
	Point Sources/WLAs	**21403.97**	**7.9**	**556.47**	**97.4**

	Total Anacostia #1	**271072.87**	**100**	**8794.13**	**96.76**

[1]Upstream loads for the MD portion of the watershed.
[2]DC delineates Watts Branch as two assessment units, but for the purposes of this TMDL, Watts Branch #1 and #2 were combined.
[3]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.
[4]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
[5]Loads presented for the Anacostia #2 segment are cumulative. The loads for Anacostia #2 include loads from MD Anacostia Tidal Segment, Kingman Lake, tributaries to Anacostia #2, and direct drainage.
[6]Upstream loads from MD include loads from the MD Anacostia Tidal Segment watershed comprising the Northeast Branch, Northwest Branch, and direct drainage to the MD Anacostia Tidal Segment, as well as upstream loads from the MD portion of the Lower Beaverdam Creek, Watts Branch, and Nash Run which drain directly to DC waters.
[7]The WLA for Super Concrete (DC0000175), a DC NPDES point source, is presented as a component of the MD Upstream Load because its discharge enters an unnamed tributary in DC which then flows eastward across the DC/MD boundary and ultimately drains into the MD Northwest Branch. This WLA was inadvertently omitted from the allocation tables in earlier drafts of the TMDL Report but was reflected in the cumulative loads entering the Anacostia River mainstem in DC and individually in the TMDL allocation spreadsheets found in the Supporting Documents. The methodology to calculate the WLA for Super Concrete was described in earlier drafts of the TMDL Report and remains the same.
[8]Loads presented for the Anacostia #1 segment are cumulative. The loads for Anacostia #1 include cumulative loads from Anacostia #2, tributaries to Anacostia #1, and direct drainage.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table 6-11 Annual Loads for Chlordane

Segment	Source	Baseline Load (g/year)	Baseline Load (%)	TMDL (g/year)	Load Reduction (%)
Kingman Lake[1]	MS4	8.64	100	0.108	98.75
	Point Sources/WLAs	**8.64**	**100**	**0.108**	**98.75**
	Total Kingman Lake	**8.64**	**100**	**0.108**	**98.75**
Popes Branch[1]	DC MS4	4.553	100	0.052	98.86
	Point Sources/WLAs	**4.553**	**100**	**0.052**	**98.86**
	Total Popes Branch	**4.553**	**100**	**0.052**	**98.86**
Texas Avenue Tributary[1]	MS4	4.47	100	0.058	98.71
	Point Sources/WLAs	**4.47**	**100**	**0.058**	**98.71**
	Total Texas Avenue Tributary	**4.47**	**100**	**0.058**	**98.71**
Anacostia #1[2]	Upstream Loads				
	Cumulative Load from Anacostia #2	1763.457	92.59	29.652	98.32
	Cumulative Load from Tributaries	6.138	0.32	0.081	98.67
	Cumulative Upstream Load	**1769.594**	**92.91**	**29.734**	**98.32**
	Anacostia #1 Direct Drainage				
	Contaminated Sites	23.177	1.22	0.083	99.64
	Nonpoint Sources/LAs	**23.177**	**1.22**	**0.083**	**99.64**
	Anacostia #1 Direct Drainage				
	CSS	35.045	1.84	0.398	98.86
	MS4	65.928	3.46	0.770	98.83

	MSGP	2.374	0.12	0.027	98.86
	DC Water Outfall 019 (DC0021199)	0.547	0.03	0.547	0
	Washington Navy Yard (DC0000141)[3]	7.909	0.42	0.030	99.62
	Point Sources/WLAs	**111.802**	**5.87**	**1.772**	**98.41**
	Total Anacostia #1	**1904.573**	**100**	**31.589**	**98.34**

[1]No LA is presented for these segments because all stormwater runoff is captured by the MS4.

[2]Loads presented for the Anacostia #1 segment are cumulative. The loads for Anacostia #1 include cumulative loads from Anacostia #2, tributaries to Anacostia #1, and direct drainage.

[3]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.

Note 1: The MOS is implicit.

Note 2: Columns may not precisely add to totals due to rounding.

Table 6-12 Annual Loads for DDT and its Metabolites

Segment	Source	Baseline Load (g/year)	Baseline Load (%)	TMDL (g/year)	Load Reduction (%)
Hickey Run[1]	MS4	1.4741	92.34	0.013	99.12
	MSGP	0.1222	7.66	0.0009	99.26
	Point Sources/WLAs	**1.5963**	**100**	**0.0139**	**99.13**
	Total Hickey Run	**1.5963**	**100**	**0.0139**	**99.13**
Kingman Lake[1]	MS4	0.7384	100	0.0061	99.17
	Point Sources/WLAs	**0.7384**	**100**	**0.0061**	**99.17**
	Total Kingman Lake	**0.7384**	**100**	**0.0061**	**99.17**
Popes Branch[1]	MS4	0.3623	100	0.0027	99.25
	Point Sources/WLAs	**0.3623**	**100**	**0.0027**	**99.25**
	Total Popes Branch	**0.3623**	**100**	**0.0027**	**99.25**
Texas Avenue Tributary[1]	MS4	0.3331	100	0.0028	99.16
	Point Sources/WLAs	**0.3331**	**100**	**0.0028**	**99.16**
	Total Texas Avenue Tributary	**0.3331**	**100**	**0.0028**	**99.16**
Anacostia #2[2]	Upstream Loads				
	MD Upstream Load[3]	83.3871	74.03	1.1602	98.61
	DC Point Source				
	Super Concrete (DC0000175)[4]	0.0109	0.01	0.0109	0
	Cumulative Load from Tributaries	23.8418	21.17	0.1882	99.21
	Load from Kingman Lake	0.7384	0.66	0.0061	99.17
	Cumulative Upstream Load	**107.9673**	**95.86**	**1.3545**	**98.75**
	Anacostia #2 Direct Drainage				
	Contaminated Sites	0.8256	0.73	0.002	99.76
	Nonpoint Sources/LAs	**0.8256**	**0.73**	**0.002**	**99.76**
	Anacostia #2 Direct Drainage				
	MS4	2.3646	2.1	0.0187	99.21

	MSGP	0.0072	0.01	0.0001	98.61
	Pepco (DC0000094)[5]	1.4705	1.31	0.004	99.73
	Point Sources/WLAs	**3.8423**	**3.41**	**0.0228**	**99.41**
	Total Anacostia #2	**112.6352**	**100**	**1.3793**	**98.78**
Anacostia #1[6]	Upstream Loads				
	Cumulative Load from Anacostia #2	112.6352	83.02	1.3793	98.78
	Cumulative Load from Tributaries	0.4449	0.33	0.0038	99.15
	Cumulative Upstream Load	**113.0801**	**83.35**	**1.3831**	**98.78**
	Anacostia #1 Direct Drainage				
	Contaminated Sites	13.0264	9.6	0.0312	99.76
	Nonpoint Sources/LAs	**13.0264**	**9.6**	**0.0312**	**99.76**
	Anacostia #1 Direct Drainage				
	CSS	2.2479	1.66	0.0166	99.26
	MS4	4.1054	3.03	0.0309	99.25
	MSGP	0.1173	0.09	0.0009	99.23
	DC Water Outfall 019 (DC0021199)	0.0307	0.02	0.0307	0
	Washington Navy Yard (DC0000141)[5]	3.0598	2.26	0.0075	99.75
	Point Sources/WLAs	**9.5611**	**7.05**	**0.0866**	**99.09**
	Total Anacostia #1	**135.6676**	**100**	**1.5009**	**98.89**

[1]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
[2]Loads presented for the Anacostia #2 segment are cumulative. The loads for Anacostia #2 include loads from MD Anacostia Tidal Segment, Kingman Lake, tributaries to Anacostia #2, and direct drainage.
[3]Upstream loads from MD include loads from the MD Anacostia Tidal Segment watershed comprising the Northeast Branch, Northwest Branch, and direct drainage to the MD Anacostia Tidal Segment, as well as upstream loads from the MD portion of the Lower Beaverdam Creek, Watts Branch, and Nash Run which drain directly to DC waters.
[4]The WLA for Super Concrete (DC0000175), a DC NPDES point source, is presented as a component of the MD Upstream Load because its discharge enters an unnamed tributary in DC which then flows eastward across the DC/MD boundary and ultimately drains into the MD Northwest Branch. This WLA was inadvertently omitted from the allocation tables in earlier drafts of the TMDL Report but was reflected in the cumulative loads entering the Anacostia River mainstem in DC and individually in the TMDL allocation spreadsheets found in the Supporting Documents. The methodology to calculate the WLA for Super Concrete was described in earlier drafts of the TMDL Report and remains the same.
[5]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.
[6]Loads presented for the Anacostia #1 segment are cumulative. The loads for Anacostia #1 include cumulative loads from Anacostia #2, tributaries to Anacostia #1, and direct drainage.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table 6-13 Annual Loads for Dieldrin

Segment	Source	Baseline Load (g/year)	Baseline Load (%)	TMDL (g/year)	Load Reduction (%)
Nash Run	MD Upstream Load[1]	0.8465	26.33	0	100
	Contaminated Sites	0.8106	25.22	0	100
	Nonpoint Sources/LAs	**1.6571**	**51.55**	**0**	**100**

	MS4	1.5574	48.45	0	100
	Point Sources/WLAs	**1.5574**	**48.45**	**0**	**100**
	Total Nash Run	**3.2145**	**100**	**0**	**100**
Watts Branch[2]	MD Upstream Load[1]	3.7154	37.04	0.0001	100
	Contaminated Sites	1.0276	10.24	0	100
	Nonpoint Sources/LAs	**4.7430**	**47.28**	**0.0001**	**100**
	MS4	4.5506	45.37	0	100
	Pepco (DC0000094)[3]	0.7373	7.35	0	100
	Point Sources/WLAs	**5.2879**	**52.72**	**0**	**100**
	Total Watts Branch	**10.03**	**100**	**0.0001**	**100**
Kingman Lake[4]	MS4	1.4418	100	0	100
	Point Sources/WLAs	**1.4418**	**100**	**0**	**100**
	Total Kingman Lake	**1.4418**	**100**	**0**	**100**
Popes Branch[4]	MS4	0.7788	100	0	100
	Point Sources/WLAs	**0.7788**	**100**	**0**	**100**
	Total Popes Branch	**0.7788**	**100**	**0**	**100**
Texas Avenue Tributary[4]	MS4	0.8062	100	0	100
	Point Sources/WLAs	**0.8062**	**100**	**0**	**100**
	Total Texas Avenue Tributary	**0.8062**	**100**	**0**	**100**
Anacostia #2[5]	Upstream Loads				
	MD Upstream Load[6]	321.5745	86.91	0.0051	100
	DC Point Source				
	Super Concrete (DC0000175)[7]	0.0007	0	0.0007	0
	Cumulative Load from Tributaries	17.6854	4.78	0	100
	Load from Kingman Lake	1.4418	0.39	0	100
	Cumulative Upstream Load	**340.7017**	**92.08**	**0.0051**	**100**
	Anacostia #2 Direct Drainage				
	Contaminated Sites	2.8862	0.78	0	100
	Nonpoint Sources/LAs	**2.8862**	**0.78**	**0**	**100**
	Anacostia #2 Direct Drainage				
	MS4	20.5017	5.54	0	100
	MSGP	0.5469	0.15	0	100
	Pepco (DC0000094)[3]	5.3818	1.45	0	100
	Point Sources/WLAs	**26.4304**	**7.14**	**0**	**100**
	Total Anacostia #2	**370.0183**	**100**	**0.0051**	**100**
Anacostia #1[8]	Upstream Loads				
	Cumulative Load from Anacostia #2	370.0183	89.87	0.0051	100
	Cumulative Load from Tributaries	1.4418	0.35	0	100
	Cumulative Upstream Load	**371.4601**	**90.22**	**0.0051**	**100**
	Anacostia #1 Direct Drainage				
	Contaminated Sites	14.3807	3.49	0	100

	Nonpoint Sources/LAs	**14.3807**	**3.49**	**0**	**100**
	Anacostia #1 Direct Drainage				
	CSS	7.4047	1.8	0	100
	MS4	13.0721	3.17	0	100
	MSGP	0.5428	0.13	0	100
	DC Water Outfall 019 (DC0021199)	0.002	0	0.002	0
	Washington Navy Yard (DC0000141)[3]	4.8805	1.19	0	100
	Point Sources/WLAs	**25.9021**	**6.29**	**0.002**	**99.99**
	Total Anacostia #1	**411.7429**	**100**	**0.0071**	**100**

[1]Upstream loads from the MD portion of the watershed.
[2]DC delineates Watts Branch as two assessment units, but for the purposes of this TMDL, Watts Branch #1 and #2 were combined.
[3]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.
[4]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
[5]Loads presented for the Anacostia #2 segment are cumulative. The loads for Anacostia #2 include loads from MD Anacostia Tidal Segment, Kingman Lake, tributaries to Anacostia #2, and direct drainage.
[6]Upstream loads from MD include loads from the MD Anacostia Tidal Segment watershed comprising the Northeast Branch, Northwest Branch, and direct drainage to the MD Anacostia Tidal Segment, as well as upstream loads from the MD portion of the Lower Beaverdam Creek, Watts Branch, and Nash Run which drain directly to DC waters.
[7]The WLA for Super Concrete (DC0000175), a DC NPDES point source, is presented as a component of the MD Upstream Load because its discharge enters an unnamed tributary in DC which then flows eastward across the DC/MD boundary and ultimately drains into the MD Northwest Branch. This WLA was inadvertently omitted from the allocation tables in earlier drafts of the TMDL Report but was reflected in the cumulative loads entering the Anacostia River mainstem in DC and individually in the TMDL allocation spreadsheets found in the Supporting Documents. The methodology to calculate the WLA for Super Concrete was described in earlier drafts of the TMDL Report and remains the same.
[8]Loads presented for the Anacostia #1 segment are cumulative. The loads for Anacostia #1 include cumulative loads from Anacostia #2, tributaries to Anacostia #1, and direct drainage.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table 6-14 Annual Loads for Heptachlor Epoxide

Segment	Source	Baseline Load (g/year)	Baseline Load (%)	TMDL (g/year)	Load Reduction (%)
Nash Run	MD Upstream Load[1]	0.710	18.26	0.013	98.17
	Contaminated Sites	1.745	44.88	0.001	99.94
	Nonpoint Sources/LAs	**2.455**	**63.15**	**0.014**	**99.43**
	MS4	1.432	36.85	0.013	99.09
	Point Sources/WLAs	**1.432**	**36.85**	**0.013**	**99.09**
	Total Nash Run	**3.887**	**100**	**0.027**	**99.31**
Popes Branch[2]	MS4	0.783	100	0.007	99.16
	Point Sources/WLAs	**0.783**	**100**	**0.007**	**99.16**
	Total Popes Branch	**0.783**	**100**	**0.007**	**99.16**
	MS4	0.747	100	0.008	98.97

Texas Avenue Tributary[2]	***Point Sources/WLAs***	**0.747**	**100**	**0.008**	**98.97**
	Total Texas Avenue Tributary	**0.747**	**100**	**0.008**	**98.97**
Anacostia #2[3]	Upstream Loads				
	MD Upstream Load[4]	256.544	85.05	2.885	98.88
	DC Point Source				
	Super Concrete (DC0000175)[5]	0.019	0.01	0.019	0
	Cumulative Load from Tributaries	17.736	5.88	0.128	99.28
	Load from Kingman Lake	1.573	0.52	0.013	99.16
	Cumulative Upstream Load	**275.853**	**91.45**	**3.027**	**98.9**
	Anacostia #2 Direct Drainage				
	Contaminated Sites	5.196	1.72	0.003	99.95
	Nonpoint Sources/LAs	**5.196**	**1.72**	**0.003**	**99.95**
	Anacostia #2 Direct Drainage				
	MS4	18.552	6.15	0.172	99.07
	MSGP	0.367	0.12	0.004	99.05
	Pepco (DC0000094)[6]	1.674	0.55	0.005	99.73
	Point Sources/WLAs	**20.593**	**6.83**	**0.18**	**99.13**
	Total Anacostia #2	**301.642**	**100**	**3.209**	**98.94**
Anacostia #1[7]	Upstream Loads				
	Cumulative Load from Anacostia #2	301.642	88.97	3.209	98.94
	Cumulative Load from Tributaries	1.062	0.31	0.01	99.09
	Cumulative Upstream Load	**302.704**	**89.28**	**3.219**	**98.94**
	Anacostia #1 Direct Drainage				
	Contaminated Sites	15.663	4.62	0.01	99.93
	Nonpoint Sources/LAs	**15.663**	**4.62**	**0.01**	**99.93**
	Anacostia #1 Direct Drainage				
	CSS	5.762	1.7	0.047	99.19
	MS4	10.985	3.24	0.103	99.06
	MSGP	0.341	0.1	0.003	99.24
	DC Water Outfall 019 (DC0021199)	0.055	0.02	0.055	0
	Washington Navy Yard (DC0000141)[6]	3.534	1.04	0.005	99.87
	Point Sources/WLAs	**20.676**	**6.1**	**0.212**	**98.98**
	Total Anacostia #1	**339.043**	**100**	**3.441**	**98.99**

[1]Upstream loads from the MD portion of the watershed.

[2]No LA is presented for these segments because all stormwater runoff is captured by the MS4.

[3]Loads presented for the Anacostia #2 segment are cumulative. The loads for Anacostia #2 include loads from MD Anacostia Tidal Segment, Kingman Lake, tributaries to Anacostia #2, and direct drainage.

[4]Upstream loads from MD include loads from the MD Anacostia Tidal Segment watershed comprising the Northeast Branch, Northwest Branch, and direct drainage to the MD Anacostia Tidal Segment, as well as upstream loads from the MD portion of the Lower Beaverdam Creek, Watts Branch, and Nash Run which drain directly to DC waters.

[5]The WLA for Super Concrete (DC0000175), a DC NPDES point source, is presented as a component of the MD Upstream Load because its discharge enters an unnamed tributary in DC which then flows eastward across the DC/MD boundary and ultimately drains into the MD Northwest Branch. This WLA was inadvertently omitted from the allocation tables in earlier drafts of the TMDL Report but was reflected in the cumulative loads entering the Anacostia River mainstem in DC and individually in the TMDL allocation spreadsheets found in the Supporting Documents. The methodology to calculate the WLA for Super Concrete was described in earlier drafts of the TMDL Report and remains the same.
[6]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.
[7]Loads presented for the Anacostia #1 segment are cumulative. The loads for Anacostia #1 include cumulative loads from Anacostia #2, tributaries to Anacostia #1, and direct drainage.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table 6-15 Annual Loads for the PAH 2 Group

Segment	Source	Baseline Load (g/year)	Baseline Load (%)	TMDL (g/year)	Load Reduction (%)
Nash Run	MD Upstream Load[1]	133.48	27.83	0	100
	Contaminated Sites	99.33	20.71	0	100
	Nonpoint Sources/LAs	**232.81**	**48.54**	**0**	**100**
	MS4	246.81	51.46	0	100
	Point Sources/WLAs	**246.81**	**51.46**	**0**	**100**
	Total Nash Run	**479.62**	**100**	**0**	**100**
Hickey Run[2]	MS4	666.17	89.23	0	100
	MSGP	80.37	10.77	0	100
	Point Sources/WLAs	**746.54**	**100**	**0**	**100**
	Total Hickey Run	**746.54**	**100**	**0**	**100**
Kingman Lake[2]	MS4	234.58	100	0	100
	Point Sources/WLAs	**234.58**	**100**	**0**	**100**
	Total Kingman Lake	**234.58**	**100**	**0**	**100**
Popes Branch[2]	DC MS4	127.78	100	0	100
	Point Sources/WLAs	**127.78**	**100**	**0**	**100**
	Total Popes Branch	**127.78**	**100**	**0**	**100**
Texas Avenue Tributary[2]	MS4	130.92	100	0	100
	Point Sources/WLAs	**130.92**	**100**	**0**	**100**
	Total Texas Avenue Tributary	**130.92**	**100**	**0**	**100**
Anacostia #2[3]	Upstream Loads				
	MD Upstream Load[4]	45852.44	85.82	5.93	99.99
	DC Point Source				
	Super Concrete (DC0000175)[5]	0.79	0	0.79	0
	Cumulative Load from Tributaries	2758.86	5.16	0	100
	Load from Kingman Lake	234.58	0.44	0	100
	Cumulative Upstream Load	**48845.89**	**91.42**	**5.93**	**99.99**

	Anacostia #2 Direct Drainage				
	Contaminated Sites	365.37	0.68	0	100
	Nonpoint Sources/LAs	**365.37**	**0.68**	**0**	**100**
	Anacostia #2 Direct Drainage				
	MS4	3285.17	6.15	0	100
	MSGP	84.12	0.16	0	100
	Pepco (DC0000094)[6]	850.92	1.59	0.02	100
	Point Sources/WLAs	**4220.21**	**7.9**	**0.02**	**100**
	Total Anacostia #2	**53431.47**	**100**	**5.95**	**99.99**
Fort Stanton Tributary[2]	MS4	188.52	100	0	100
	Point Sources/WLAs	**188.52**	**100**	**0**	**100**
	Total Fort Stanton Tributary	**188.52**	**100**	**0**	**100**
Anacostia #1[7]	Upstream Loads				
	Cumulative Load from Anacostia #2	53431.47	89.83	5.95	99.99
	Cumulative Load from Tributaries	188.52	0.32	0	100
	Cumulative Upstream Load	**53619.99**	**90.15**	**5.95**	**99.99**
	Anacostia #1 Direct Drainage				
	Contaminated Sites	1883.21	3.79	0	100
	Nonpoint Sources/LAs	**1883.21**	**3.79**	**0**	**100**
	Anacostia #1 Direct Drainage				
	CSS	1145.92	1.93	0	100
	MS4	2057.31	3.46	0	100
	MSGP	84.43	0.14	0	100
	DC Water Outfall 019 (DC0021199)	2.22	0	2.22	0
	Washington Navy Yard (DC0000141)[6]	685.23	1.15	0	100
	Point Sources/WLAs	**3975.11**	**6.68**	**2.22**	**99.94**
	Total Anacostia #1	**59478.31**	**100**	**8.17**	**99.99**

[1]Upstream loads from the MD portion of the watershed.

[2]No LA is given for these segments because all stormwater runoff is captured by the MS4.

[3]Loads presented for the Anacostia #2 segment are cumulative. The loads for Anacostia #2 include loads from MD Anacostia Tidal Segment, Kingman Lake, tributaries to Anacostia #2, and direct drainage.

[4]Upstream loads from MD include loads from the MD Anacostia Tidal Segment watershed comprising the Northeast Branch, Northwest Branch, and direct drainage to the MD Anacostia Tidal Segment, as well as upstream loads from the MD portion of the Lower Beaverdam Creek, Watts Branch, and Nash Run which drain directly to DC waters.

[5]The WLA for Super Concrete (DC0000175), a DC NPDES point source, is presented as a component of the MD Upstream Load because its discharge enters an unnamed tributary in DC which then flows eastward across the DC/MD boundary and ultimately drains into the MD Northwest Branch. This WLA was inadvertently omitted from the allocation tables in earlier drafts of the TMDL Report but was reflected in the cumulative loads entering the Anacostia River mainstem in DC and individually in the TMDL allocation spreadsheets found in the Supporting Documents. The methodology to calculate the WLA for Super Concrete was described in earlier drafts of the TMDL Report and remains the same.

[6]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.

[7]Loads presented for the Anacostia #1 segment are cumulative. The loads for Anacostia #1 include cumulative loads from Anacostia #2, tributaries to Anacostia #1, and direct drainage.

Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table 6-16 Annual Loads for the PAH 3 Group

Segment	Source	Baseline Load (g/year)	Baseline Load (%)	TMDL (g/year)	Load Reduction (%)
Nash Run	MD Upstream Load[1]	109.544	27.52	0	100
	Contaminated Sites	85.432	21.46	0	100
	Nonpoint Sources/LAs	**194.976**	**48.98**	**0**	**100**
	MS4	203.136	51.02	0	100
	Point Sources/WLAs	**203.136**	**51.02**	**0**	**100**
	Total Nash Run	**398.112**	**100**	**0**	**100**
Hickey Run[2]	MS4	548.047	89.33	0	100
	MSGP	65.433	10.67	0	100
	Point Sources/WLAs	**613.480**	**100**	**0**	**100**
	Total Hickey Run	**613.480**	**100**	**0**	**100**
Kingman Lake[2]	MS4	194.646	100	0	100
	Point Sources/WLAs	**194.646**	**100**	**0**	**100**
	Total Kingman Lake	**194.646**	**100**	**0**	**100**
Popes Branch[2]	MS4	105.882	100	0	100
	Point Sources/WLAs	**105.882**	**100**	**0**	**100**
	Total Popes Branch	**105.882**	**100**	**0**	**100**
Texas Avenue Tributary[2]	MS4	108.108	100	0	100
	Point Sources/WLAs	**108.108**	**100**	**0**	**100**
	Total Texas Avenue Tributary	**108.108**	**100**	**0**	**100**
Anacostia #2[3]	Upstream Loads				
	MD Upstream Load[4]	37799.869	85.83	0.628	100
	DC Point Source				
	Super Concrete (DC0000175)[5]	0.079	0.0002	0.079	0
	Cumulative Load from Tributaries	2277.72	5.17	0	100
	Load from Kingman Lake	194.646	0.44	0	100
	Cumulative Upstream Load	**40272.234**	**91.45**	**0.628**	**100**
	Anacostia #2 Direct Drainage				
	Contaminated Sites	308.081	0.7	0	100
	Nonpoint Sources/LAs	**308.081**	**0.7**	**0**	**100**
	Anacostia #2 Direct Drainage				
	MS4	2706.931	6.15	0	100
	MSGP	68.507	0.16	0	100
	Pepco (DC0000094)[6]	683.176	1.55	0.002	100
	Point Sources/WLAs	**3458.614**	**7.85**	**0**	**100**
	Total Anacostia #2	**44038.93**	**100**	**0.63**	**100**

Fort Stanton Tributary[2]	MS4	154.676	100	0	100
	Point Sources/WLAs	**154.676**	**100**	**0**	**100**
	Total Fort Stanton Tributary	**154.676**	**100**	**0**	**100**
Anacostia #1[7]	Upstream Loads				
	Cumulative Load from Anacostia #2	44038.93	89.9	0.63	100
	Cumulative Load from Tributaries	154.676	0.32	0	100
	Cumulative Upstream Load	**44193.606**	**90.22**	**0.63**	**100**
	Anacostia #1 Direct Drainage				
	Contaminated Sites	1540.955	3.15	0	100
	Nonpoint Sources/LAs	**1540.955**	**3.15**	**0**	**100**
	Anacostia #1 Direct Drainage				
	CSS	936.299	1.91	0	100
	MS4	1687.803	3.45	0	100
	MSGP	68.74	0.14	0	100
	DC Water Outfall 019 (DC0021199)	0.222	0	0.222	0
	Washington Navy Yard (DC0000141)[6]	558.308	1.14	0	100
	Point Sources/WLAs	**3251.373**	**6.64**	**0.222**	**100**
	Total Anacostia #1	**48985.934**	**100**	**0.852**	**100**

[1]Upstream loads from the MD portion of the watershed.

[2]No LA is presented for these segments because all stormwater runoff is captured by the MS4.

[3]Loads presented for the Anacostia #2 segment are cumulative. The loads for Anacostia #2 include loads from MD Anacostia Tidal Segment, Kingman Lake, tributaries to Anacostia #2, and direct drainage.

[4]Upstream loads from MD include loads from the MD Anacostia Tidal Segment watershed comprising the Northeast Branch, Northwest Branch, and direct drainage to the MD Anacostia Tidal Segment, as well as upstream loads from the MD portion of the Lower Beaverdam Creek, Watts Branch, and Nash Run which drain directly to DC waters.

[5]The WLA for Super Concrete (DC0000175), a DC NPDES point source, is presented as a component of the MD Upstream Load because its discharge enters an unnamed tributary in DC which then flows eastward across the DC/MD boundary and ultimately drains into the MD Northwest Branch. This WLA was inadvertently omitted from the allocation tables in earlier drafts of the TMDL Report but was reflected in the cumulative loads entering the Anacostia River mainstem in DC and individually in the TMDL allocation spreadsheets found in the Supporting Documents. The methodology to calculate the WLA for Super Concrete was described in earlier drafts of the TMDL Report and remains the same.

[6]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.

[7]Loads presented for the Anacostia #1 segment are cumulative. The loads for Anacostia #1 include cumulative loads from Anacostia #2, tributaries to Anacostia #1, and direct drainage.

Note 1: The MOS is implicit.

Note 2: Columns may not precisely add to totals due to rounding.

6.5 Contaminated Site LAs

In Tables 6-3 through 6-16, the loads associated with the contaminated sites are consolidated into one row. Tables 6-17 through 6-42 expand on that consolidated row and provide individual LAs for each contaminated site. Tables 6-17 through 6-23 provide daily LAs for each contaminated site for each pollutant. Tables 6-24 through 6-30 provide annual LAs for each contaminated site for each pollutant.

6.5.1 Daily LAs

Table 6-17 Contaminated Site Daily LAs for Arsenic

Segment	Contaminated Site	LA (g/day)
Nash Run	Kenilworth Park Landfill North	0.24
Watts Branch	Kenilworth Park Landfill North	0.21
Fort Dupont Creek	CSX	0.18
Anacostia #2	CSX	1.34
	Kenilworth Park Landfill North	4.77
	Kenilworth Park Landfill South	0.67
Anacostia #1	Firth Sterling Steel	0.16
	Former Hess Petroleum Terminal	10.54
	Former Steuart Petroleum	0.40
	Fort McNair	2.61
	JBAB AOC 1	0.20
	JBAB Site 1	0.35
	JBAB Site 2	13.47
	JBAB Site 3	0.64
	Joint Base Anacostia-Bolling (JBAB)	0.06
	Poplar Point	11.73
	Southeast Federal Center	6.55
	Washington Gas	4.59

Table 6-18 Contaminated Site Daily LAs for Chlordane

Segment	Contaminated Site	LA (g/day)
Anacostia #1	Firth Sterling Steel	2.79E-04
	Former Hess Petroleum Terminal	2.05E-02
	Former Steuart Petroleum	8.36E-04
	Fort McNair	5.43E-03
	JBAB AOC 1	4.18E-04
	JBAB Site 1	9.75E-04
	JBAB Site 2	3.08E-02
	JBAB Site 3	1.25E-03
	Joint Base Anacostia-Bolling (JBAB)	1.39E-04
	Poplar Point	2.62E-02
	Southeast Federal Center	2.02E-02
	Washington Gas	9.19E-03

Table 6-19 Contaminated Site Daily LAs for DDT and its Metabolites

Segment	Contaminated Site	LA (g/day)
Anacostia #2	CSX	4.82E-04
	Kenilworth Park Landfill North	4.88E-03
	Kenilworth Park Landfill South	1.02E-03
Anacostia #1	Firth Sterling Steel	5.18E-05
	Former Hess Petroleum Terminal	1.91E-03
	Former Steuart Petroleum	1.55E-04
	Fort McNair	1.09E-03
	JBAB AOC 1	5.18E-05
	JBAB Site 1	1.04E-04
	JBAB Site 2	3.42E-03
	JBAB Site 3	2.07E-04
	Joint Base Anacostia-Bolling (JBAB)	0
	Poplar Point	5.90E-03
	Southeast Federal Center	1.97E-03
	Washington Gas	1.29E-03

Table 6-20 Contaminated Site Daily LAs for Dieldrin

Segment	Contaminated Site	LA (g/day)
Nash Run	Kenilworth Park Landfill North	0
Watts Branch	Kenilworth Park Landfill North	0
Anacostia #2	CSX	0
	Kenilworth Park Landfill North	0
	Kenilworth Park Landfill South	0
Anacostia #1	Firth Sterling Steel	0
	Former Hess Petroleum Terminal	0
	Former Steuart Petroleum	0
	Fort McNair	0
	JBAB AOC 1	0
	JBAB Site 1	0
	JBAB Site 2	0
	JBAB Site 3	0
	Joint Base Anacostia-Bolling (JBAB)	0
	Poplar Point	0
	Southeast Federal Center	0
	Washington Gas	0

Table 6-21 Contaminated Site Daily LAs for Heptachlor Epoxide

Segment	Contaminated Site	LA (g/day)
Nash Run	Kenilworth Park Landfill North	2.64E-04
Anacostia #2	CSX	7.26E-04
	Kenilworth Park Landfill North	2.76E-03
	Kenilworth Park Landfill South	5.81E-04
Anacostia #1	Firth Sterling Steel	0
	Former Hess Petroleum Terminal	2.96E-03
	Former Steuart Petroleum	1.56E-04
	Fort McNair	7.80E-04
	JBAB AOC 1	0
	JBAB Site 1	1.56E-04
	JBAB Site 2	4.37E-03
	JBAB Site 3	1.56E-04
	Joint Base Anacostia-Bolling (JBAB)	0
	Poplar Point	4.05E-03
	Southeast Federal Center	2.18E-03
	Washington Gas	1.09E-03

Table 6-22 Contaminated Site Daily LAs for the PAH 2 Group

Segment	Contaminated Site	LA (g/day)
Nash Run	Kenilworth Park Landfill North	0
Anacostia #2	CSX	0
	Kenilworth Park Landfill North	0
	Kenilworth Park Landfill South	0
Anacostia #1	Firth Sterling Steel	0
	Former Hess Petroleum Terminal	0
	Former Steuart Petroleum	0
	Fort McNair	0
	JBAB AOC 1	0
	JBAB Site 1	0
	JBAB Site 2	0
	JBAB Site 3	0
	Joint Base Anacostia-Bolling (JBAB)	0
	Poplar Point	0
	Southeast Federal Center	0
	Washington Gas	0

Table 6-23 Contaminated Site Daily LAs for the PAH 3 Group

Segment	Contaminated Site	LA (g/day)
Nash Run	Kenilworth Park Landfill North	0
Anacostia #2	CSX	0
	Kenilworth Park Landfill North	0
	Kenilworth Park Landfill South	0
Anacostia #1	Firth Sterling Steel	0
	Former Hess Petroleum Terminal	0
	Former Steuart Petroleum	0
	Fort McNair	0
	JBAB AOC 1	0
	JBAB Site 1	0
	JBAB Site 2	0
	JBAB Site 3	0
	Joint Base Anacostia-Bolling (JBAB)	0
	Poplar Point	0
	Southeast Federal Center	0
	Washington Gas	0

6.5.2 Annual LAs

Table 6-24 Contaminated Site Annual LAs for Arsenic

Segment	Contaminated Site	LA (g/year)
Nash Run	Kenilworth Park Landfill North	0.79
Watts Branch	Kenilworth Park Landfill North	0.95
Fort Dupont Creek	CSX	0.32
Anacostia #2	CSX	0.49
	Kenilworth Park Landfill North	1.73
	Kenilworth Park Landfill South	0.24
Anacostia #1	Firth Sterling Steel	0.02
	Former Hess Petroleum Terminal	1.62
	Former Steuart Petroleum	0.06
	Fort McNair	0.40
	JBAB AOC 1	0.03
	JBAB Site 1	0.05
	JBAB Site 2	2.07
	JBAB Site 3	0.10
	Joint Base Anacostia-Bolling (JBAB)	0.01
	Poplar Point	1.81

	Southeast Federal Center	1.01
	Washington Gas	0.71

Table 6-25 Contaminated Site Annual LAs for Chlordane

Segment	Contaminated Site	LA (g/year)
Anacostia #1	Firth Sterling Steel	2.00E-04
	Former Hess Petroleum Terminal	1.47E-02
	Former Steuart Petroleum	6.00E-04
	Fort McNair	3.90E-03
	JBAB AOC 1	3.00E-04
	JBAB Site 1	7.00E-04
	JBAB Site 2	2.21E-02
	JBAB Site 3	9.00E-04
	Joint Base Anacostia-Bolling (JBAB)	1.00E-04
	Poplar Point	1.88E-02
	Southeast Federal Center	1.45E-02
	Washington Gas	6.60E-03

Table 6-26 Contaminated Site Annual LAs for DDT and its Metabolites

Segment	Contaminated Site	LA (g/year)
Anacostia #2	CSX	8.00E-04
	Kenilworth Park Landfill North	8.10E-03
	Kenilworth Park Landfill South	1.70E-03
Anacostia #1	Firth Sterling Steel	1.00E-04
	Former Hess Petroleum Terminal	3.70E-03
	Former Steuart Petroleum	3.00E-04
	Fort McNair	2.10E-03
	JBAB AOC 1	1.00E-04
	JBAB Site 1	2.00E-04
	JBAB Site 2	6.60E-03
	JBAB Site 3	4.00E-04
	Joint Base Anacostia-Bolling (JBAB)	0
	Poplar Point	1.14E-02
	Southeast Federal Center	3.80E-03
	Washington Gas	2.50E-03

Table 6-27 Contaminated Site Annual LAs for Dieldrin

Segment	Contaminated Site	LA (g/year)

Nash Run	Kenilworth Park Landfill North	0
Watts Branch	Kenilworth Park Landfill North	0
Anacostia #2	CSX	0
	Kenilworth Park Landfill North	0
	Kenilworth Park Landfill South	0
Anacostia #1	Firth Sterling Steel	0
	Former Hess Petroleum Terminal	0
	Former Steuart Petroleum	0
	Fort McNair	0
	JBAB AOC 1	0
	JBAB Site 1	0
	JBAB Site 2	0
	JBAB Site 3	0
	Joint Base Anacostia-Bolling (JBAB)	0
	Poplar Point	0
	Southeast Federal Center	0
	Washington Gas	0

Table 6-28 Contaminated Site Annual LAs for Heptachlor Epoxide

Segment	Contaminated Site	LA (g/year)
Nash Run	Kenilworth Park Landfill North	1.00E-03
Anacostia #2	CSX	5.00E-04
	Kenilworth Park Landfill North	1.90E-03
	Kenilworth Park Landfill South	4.00E-04
Anacostia #1	Firth Sterling Steel	0
	Former Hess Petroleum Terminal	1.90E-03
	Former Steuart Petroleum	1.00E-04
	Fort McNair	5.00E-04
	JBAB AOC 1	0
	JBAB Site 1	1.00E-04
	JBAB Site 2	2.80E-03
	JBAB Site 3	1.00E-04
	Joint Base Anacostia-Bolling (JBAB)	0
	Poplar Point	2.60E-03
	Southeast Federal Center	1.40E-03
	Washington Gas	7.00E-04

Table 6-29 Contaminated Site Annual LAs for the PAH 2 Group

Segment	Contaminated Site	LA (g/year)

Nash Run	Kenilworth Park Landfill North	0
Anacostia #2	CSX	0
	Kenilworth Park Landfill North	0
	Kenilworth Park Landfill South	0
Anacostia #1	Firth Sterling Steel	0
	Former Hess Petroleum Terminal	0
	Former Steuart Petroleum	0
	Fort McNair	0
	JBAB AOC 1	0
	JBAB Site 1	0
	JBAB Site 2	0
	JBAB Site 3	0
	Joint Base Anacostia-Bolling (JBAB)	0
	Poplar Point	0
	Southeast Federal Center	0
	Washington Gas	0

Table 6-30 Contaminated Site Annual LAs for the PAH 3 Group

Segment	Contaminated Site	LA (g/year)
Nash Run	Kenilworth Park Landfill North	0
Anacostia #2	CSX	0
	Kenilworth Park Landfill North	0
	Kenilworth Park Landfill South	0
Anacostia #1	Firth Sterling Steel	0
	Former Hess Petroleum Terminal	0
	Former Steuart Petroleum	0
	Fort McNair	0
	JBAB AOC 1	0
	JBAB Site 1	0
	JBAB Site 2	0
	JBAB Site 3	0
	Joint Base Anacostia-Bolling (JBAB)	0
	Poplar Point	0
	Southeast Federal Center	0
	Washington Gas	0

6.6 MSGP WLAs

In Tables 6-3 through 6-16, the loads associated with the MSGP are consolidated into one row. Tables 6-31 and 6-32 expand on that consolidated row and provide individual WLAs for individual MSGP facilities. Table 6-31 provides daily WLAs for individual MSGP facilities for each pollutant. Tables 6-32 provides annual WLAs for individual MSGP facilities for each pollutant.

6.6.1 Daily WLAs

Table 6-31 Daily WLAs for Individual MSGP Facilities

Segment	Facility	Drains To	Arsenic (g/day)	Chlordane (g/day)	DDT (g/day)	Dieldrin (g/day)	Heptachlor Epoxide (g/day)	PAH 2 (g/day)	PAH 3 (g/day)
Hickey Run[1]	DCR053008	MS4	-	-	6.83E-05	-	-	0	0
	DCR053030	MS4	-	-	7.07E-05	-	-	0	0
	DCR053043	MS4	-	-	1.47E-05	-	-	0	0
	DCR053046	MS4	-	-	1.16E-05	-	-	0	0
	DCR05J000	MS4	-	-	2.80E-05	-	-	0	0
	DCR05J003	MS4	-	-	3.34E-05	-	-	0	0
Anacostia #2[2]	DCR05J004	MS4	10.18	-	1.74E-03	0	6.14E-03	0	0
Anacostia #1	DCR050002	MS4	0.21	1.19E-03	4.02E-05	0	1.30E-04	0	0
	DCR053010	Anacostia River	2.05	1.19E-02	4.01E-04	0	1.30E-03	0	0
	DCR053015	CSS	1.23	7.14E-03	2.41E-04	0	7.81E-04	0	0
	DCR053016	MS4	0.88	5.08E-03	1.71E-04	0	5.56E-04	0	0
	DCR053018	Anacostia River	0.52	3.00E-03	1.01E-04	0	3.28E-04	0	0
	DCR053024	MS4	0.36	2.10E-03	7.08E-05	0	2.29E-04	0	0
	DCR053030	CSS	10.20	5.90E-02	1.99E-03	0	6.45E-03	0	0
	DCR053056	Anacostia River	0.61	3.51E-03	1.18E-04	0	3.84E-04	0	0
	DCR05J000	CSS	2.95	1.71E-02	5.76E-04	0	1.87E-03	0	0

[1]Hickey Run is not listed as impaired for arsenic, chlordane, dieldrin, and heptachlor epoxide but WLAs for each MSGP facility for those pollutants are in a separate table in Appendix A.

[2]Anacostia #2 is not listed as impaired for chlordane but WLAs for each MSGP facility for that pollutant are in a separate table in Appendix A.

6.6.2 Annual WLAs

Table 6-32 Annual WLAs for Individual MSGP Facilities

Segment	Facility	Drains To	Arsenic (g/year)	Chlordane (g/year)	DDT (g/year)	Dieldrin (g/year)	Heptachlor Epoxide (g/year)	PAH 2 (g/year)	PAH 3 (g/year)
Hickey Run[1]	DCR053008	MS4	-	-	2.71E-04	-	-	0	0
	DCR053030	MS4	-	-	2.81E-04	-	-	0	0
	DCR053043	MS4	-	-	5.84E-05	-	-	0	0
	DCR053046	MS4	-	-	4.60E-05	-	-	0	0
	DCR05J000	MS4	-	-	1.11E-04	-	-	0	0
	DCR05J003	MS4	-	-	1.32E-04	-	-	0	0
Anacostia #2[2]	DCR05J004	MS4	6.08	-	1.10E-03	0	3.60E-03	0	0
Anacostia #1	DCR050002	MS4	0.12	6.08E-04	2.16E-05	0	6.71E-05	0	0
	DCR053010	Anacostia River	1.19	6.07E-03	2.16E-04	0	6.70E-04	0	0
	DCR053015	CSS	0.72	3.65E-03	1.30E-04	0	4.03E-04	0	0
	DCR053016	MS4	0.51	2.60E-03	9.24E-05	0	2.86E-04	0	0
	DCR053018	Anacostia River	0.30	1.53E-03	5.46E-05	0	1.69E-04	0	0
	DCR053024	MS4	0.21	1.07E-03	3.82E-05	0	1.18E-04	0	0
	DCR053030	CSS	5.94	3.02E-02	1.07E-03	0	3.33E-03	0	0
	DCR053056	Anacostia River	0.35	1.79E-03	6.38E-05	0	1.98E-04	0	0
	DCR05J000	CSS	1.72	8.72E-03	3.10E-04	0	9.62E-04	0	0

[1]Hickey Run is not listed as impaired for arsenic, chlordane, dieldrin, and heptachlor epoxide but WLAs for each MSGP facility for those pollutants are in a separate table in Appendix A.
[2]Anacostia #2 is not listed as impaired for chlordane but WLAs for each MSGP facility for that pollutant are in a separate table in Appendix A.

6.7 Margin of Safety

Under the CWA, a TMDL must provide a "margin of safety (MOS) which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality." 33 U.S.C. 1313(d)(1)(C). The MOS can account for uncertainty in the load estimates and the simulation process affecting pollutant fate and transport. There are two ways to incorporate the MOS: (1) implicitly by using conservative model assumptions to develop allocations or (2) explicitly by specifying a portion of the TMDL as the MOS and using the remainder for allocations (U.S. EPA, 1991). *Anacostia Riverkeeper v. Jackson,* 798 F. Supp. 2d 210 (D.D.C., 2011).

The modeling framework applied to develop these TMDLs was calibrated against monitoring data collected throughout the watershed and from impaired waterbodies. Although these monitoring data represented actual conditions, they were not of a continuous time series and may not have captured the full range of in-stream conditions that occurred during the simulation period. Capturing the full range of in-stream conditions was difficult for some of these toxic pollutants since, for some pollutants, the method detection limit is above WQC, and confidence in model predictions below the method detection limit was difficult to discern. An implicit MOS was selected to account for those cases when monitoring might not have captured the full range of in-stream conditions.

There is an implicit margin of safety achieved through the adoption of conservative analyses and modeling assumptions. Conservative assumptions include the following:

- The modeling framework and TMDLs did not account for the construction and operation of the Anacostia River Tunnel System, parts of which were completed in both 2018 and 2023, which is expected to capture and divert most of the CSOs for treatment. Operation of the tunnel system is expected to reduce the number, frequency, and volume of CSOs from the CSS to the Anacostia River and its tributaries. Specifically, through early December 2019, D.C. Water reported that the Anacostia River Tunnel System removed 90 percent of the combined sewer overflow that would have otherwise entered the river. The Northeast Boundary Tunnel project, which was recently completed in September 2023, will remove additional CSOs from entering the Anacostia River. It is anticipated that combined sewer overflows will be reduced by 98 percent, which is expected to achieve significant reductions in the toxic loads from the CSS. The reduction in CSOs due to the operation of the Anacostia River Tunnel system is not captured by the model simulation period and is considered part of the margin of safety.
- The discharge at Outfall 019 from the Northeast Boundary Swirl Concentrator Facility was included within the simulation, but the Northeast Boundary Swirl Concentrator Facility subsequently was taken out of service permanently. Outfall 019 remains an active CSS outfall and Outfall 019a has been added to accommodate discharges that may occur when the Anacostia River Tunnel reaches capacity. Discharges through Outfall 019a will be part of the allocation to the CSS. It is anticipated that discharges through Outfall 019 will be less frequent/lower volume with the operation of the tunnel than the modeled discharge from the Northeast Boundary Swirl Concentrator.
- For the four individually permitted facilities, WLAs were calculated based on maximum flows from dischargers set by design flows specified in the NPDES permit for each facility as opposed to the actual, smaller reported flow.

- Modeled total DDT and used the most stringent of the metabolite criteria (DDE) as the TMDL endpoint for allocations. Using the most stringent of the applicable criteria for the three parameters as the endpoint ensures that the criterion for that individual, most stringent metabolite is met. Further, doing so is more protective than required for the other DDT metabolites that have less stringent criteria. The TMDL ensures that the sum of all metabolites of DDT will not exceed the criteria associated with the most stringent metabolite, meaning that the metabolites individually will be below their criteria threshold, especially those metabolites with less stringent criteria.
- The PAHs were placed into groups based on ring structure, using the most stringent criterion within each group as the TMDL endpoint for allocations. Using the most stringent criterion to represent an entire PAH group as the TMDL endpoint ensures that the criterion for that individual most stringent PAH is met. Further, it is more protective than required for the other individual PAHs within that group that have less stringent criteria. Similar to DDT and its metabolites above, the TMDL ensures that the sum of all PAHs within each group will not exceed the criterion associated with the most stringent PAH, meaning that each PAH individually will be below their criteria threshold, especially those with criteria that are less stringent than the most stringent PAH in that group.
- TMDLs were developed based on the entire simulated period of 2014-2017 to incorporate the widest range in environmental conditions rather than a shorter period of time, which may not include relatively wet or dry periods. A review of the associated weather data showed that the 2014-2017 simulation period captured a wide range of conditions and included high and low river flow periods.
- When water quality monitoring data recorded a non-detect, concentrations were applied at approximately half the detection limit rather than zero during model setup and calibration.

6.8 Critical Conditions and Seasonal Variations

EPA regulations (40 C.F.R. 130.7(c)(1)) require TMDLs to account for critical conditions for stream flow, loading, and water quality parameters to ensure that the water quality and designated uses of the waterbodies are protected during periods when they are most vulnerable. Critical conditions include combinations of environmental factors that result in attaining and maintaining the endpoints and have an acceptably low frequency of occurrence (U.S. EPA, 2001). Critical conditions for stream flow, loading, and water quality parameters are captured in the modeling framework for these TMDLs.

Toxic pollutant TMDLs for the Anacostia River watershed adequately address critical conditions for flow by using a dynamic model and analysis of all flow conditions in the basin. Available water quality and flow data show that critical conditions for toxic parameters in the watershed occur under all conditions (i.e., under both low flow and high flow scenarios). For example, during wet periods with high flow, stormwater runoff results in water quality exceedances while during dry periods, flux from contaminated bed sediments result in water quality exceedances. Therefore, the use of a dynamic modeling application capable of representing conditions resulting from both low and high flow regimes is appropriate. In addition, the dynamic modeling platform simulates water quality on an hourly time step, ensuring that acute conditions, as well as long-term conditions, are considered.

The linkage of the tidal Anacostia River to a dynamic watershed loading model ensures that nonpoint and stormwater source loads from the watershed delivered at times other than the critical period were also considered in the analysis. The TMDLs are based on the entire modeled period of 2014 through 2017.

Critical conditions for toxic pollutant loads were also considered by determining WLAs based on maximum flows from dischargers set by design flows specified in non-stormwater NPDES permits for each facility. Use of design flows in in TMDL development provides additional assurance that, when design flows are reached, the water quality in the stream will meet the TMDL endpoints.

Model simulation of multiple complete years accounted for seasonal variations. Continuous simulation (modeling over a period of several years that captured precipitation extremes) inherently considers seasonal hydrologic and source loading variability. The pollutant concentrations were simulated on a sub-daily time step, capturing seasonal variation, and allowing for evaluation of critical conditions.

7 CLIMATE CHANGE

As a result of climate change, it is expected that the District will experience warmer average temperatures, more frequent and intense heavy rain events, and higher tides as a result of rising sea level. In fact, in the last 50 years, the District's average annual temperature increased by 2°F (DOEE, 2019). Specifically, within the national park boundaries of Rock Creek, the annual average temperatures increased 2°F from 1950 to 2013, with the greatest increase in summer (NPS, 2017). Average annual rainfall has not changed significantly; however, more rainfall is occurring in the fall and winter and less in the summer (DOEE, 2019). This seasonal increase in rainfall affects the volume and transport of runoff and associated pollutants.

7.1 Climate Change Scenario Methodology

To assess TMDL implications under future climate scenarios, the fate and transport of seven toxic pollutants (Table 1-3) was simulated under conditions of climate induced changes in precipitation quantity and intensity, air temperature, and sea level rise. The projected climate change effects and time horizons selected for this analysis were chosen to be consistent with the Chesapeake Bay Program's medium- to long-term planning outlook (Shenk, et al., 2021). This approach was adopted to align methodology and the future horizons to a larger regional (and widely accepted) modeling effort in the Chesapeake Bay. Details of this analysis can be found in Appendix B (Tetra Tech, 2023a).

A climate change analysis was performed for two time horizons: a near-term horizon around 2035 (2034-2037) and a long-term horizon around 2055 (2054-2057). For each time horizon, and for each of the seven toxic pollutants (Table 1-3 Numeric Water Quality Criteria for District Waters), two sets of model runs were conducted:

- The first scenario (Climate Change Scenario) was designed to assess change in water column concentrations for each pollutant group under future climate scenarios in tandem with the TMDL allocation scenario. The model setup used in the climate change analysis was unchanged from the model setup used in developing the TMDL allocation scenario except for the projected changes in the three climate factors (precipitation quantity and intensity, air temperature, and sea level rise).

- The second scenario (Natural Attenuation Scenario) was designed to estimate how long natural attenuation of toxic pollutants in bed sediment will take considering climate change impacts relative to the natural attenuation results documented in the TMDL.

The climate change analysis described herein represents a major revision from the earlier draft of the TMDLs that was released for public notice and comment in 2021.

7.2 Climate Change Scenario Results

7.2.1 Impacts of Climate Change on Tidal Anacostia River Water Quality

The results of the near-term (circa 2035) and long-term (circa 2055) climate change scenarios are shown in Table 7.1 and Table 7.2, respectively. These tables show the difference between the TMDL scenario, which is characterized by watershed TMDL allocations and bed sediment reductions that meet water quality targets under existing climate conditions during 2014-2017, and the climate change scenarios characterized by climate change. In simpler terms, Tables 7.1 and 7.2 present the comparison of water column concentrations between the TMDL scenario and the climate change scenarios (2035 and 2055) across all pollutants. Detailed results of this analysis can be found in Appendix B (Tetra Tech, 2023a).

Results of the LSPC simulations suggest that additional toxicant loads are generated under climate change conditions for both near-term and long-term scenarios due to increased precipitation and associated runoff. For instance, chlordane concentrations consistently increase under both climate change scenarios across all verification units. While some verification unit-pollutant combinations show an increase in predicted toxic water column concentrations under the climate change scenarios (e.g., heptachlor epoxide, DDT and its metabolites, and chlordane), most increase less than five percent.

On the other hand, the tidal Anacostia River receiving these loads shows improvement in some areas for some pollutant groups due to dilution from sea level rise and other hydrologic processes. For example, under both 2035 and 2055 scenarios (Tables 7.1 and 7.2, respectively), PAH concentrations improve consistently throughout all verification units, as do metals (with few exceptions) and dieldrin.

Although there are few increases in toxic pollutant concentrations in these areas, only one toxic pollutant exceeds the TMDL water column target in only one verification unit. The maximum 30-day average heptachlor epoxide concentrations exceed the TMDL target in the Anacostia 1-1 verification unit in the 2055 climate change scenario (Table 7.2). This is the only verification unit and contaminant that would exceed the water column TMDL target under near-term or long-term climate change conditions.

The organochlorine pesticides, on the other hand, tend to increase in concentration, except for dieldrin. In general, verification units downstream of Anacostia verification unit 2-7 (Figure 5-1) are negatively impacted by climate change, likely due to increased CSS contributions within this region. This is particularly evident in the 2055 scenario for which there is a greater intensification of precipitation. However, as noted previously in Section 3.2.2, the TMDL model does not account for the on-the-ground changes due to the operation of the Anacostia River Tunnel System; therefore, the simulated increase of pesticides due to increased CSS contributions may be prevented to a certain extent by the operation of the Anacostia River Tunnel System.

Table 7.1 Comparison of the TMDL and near-term 2035 scenario water column results (maximum 30-day average concentration) for the tidal Anacostia River by verification unit and toxicant.

2035 Climate Change Scenario	Pollutant:	Arsenic	Heptachlor epoxide	Chlordane	Dieldrin	DDT	PAH 2	PAH 3	
	TMDL Endpoint (µg/l):	0.14	3.20E-05	3.20E-04	1.20E-06	1.80E-05	1.30E-03	1.30E-04	
	Verification Unit	Change in Maximum 30-day Average Concentration (%)							Average:
Upstream	Anacostia #2-10	-0.2%	3.7%	3.2%	-4.3%	2.8%	-2.3%	-1.9%	-0.7%
	Anacostia #2-9	-2.7%	3.7%	3.3%	-5.8%	2.9%	-4.6%	-4.4%	-2.1%
	Anacostia #2-8	-3.4%	3.7%	3.2%	-6.7%	2.8%	-5.9%	-5.6%	-2.5%
	Kingman Lake-2	-1.2%	3.6%	3.3%	-4.8%	3.0%	-1.6%	-1.8%	-1.1%
	Anacostia #2-7	-3.7%	4.0%	3.6%	-6.5%	3.2%	-5.6%	-5.3%	-2.4%
	Anacostia #2-6	-3.6%	1.0%	4.4%	-5.5%	4.0%	-4.9%	-4.3%	-2.6%
	Kingman Lake-1	-2.4%	4.6%	4.4%	-5.8%	4.0%	-4.1%	-3.9%	-2.1%
	Anacostia #2-5	-3.1%	0.1%	4.4%	-5.0%	4.1%	-4.3%	-3.5%	-2.9%
	Anacostia #2-4	-2.5%	0.1%	4.2%	-4.7%	3.8%	-3.5%	-3.2%	-2.9%
	Anacostia #2-3	-2.2%	-0.6%	4.3%	-4.4%	2.2%	-3.6%	-3.2%	-2.8%
	Anacostia #2-2	-2.0%	-1.2%	4.3%	-4.3%	1.0%	-3.4%	-3.1%	-2.8%
	Anacostia #2-1	-1.8%	-1.2%	4.3%	-4.2%	-0.5%	-3.3%	-3.0%	-2.8%
	Anacostia #1-2	-1.2%	-0.9%	4.1%	-3.8%	-0.4%	-2.9%	-2.6%	-2.2%
Downstream	Anacostia #1-1	-0.3%	3.9%	3.6%	-1.3%	-0.1%	-1.4%	-1.2%	-0.2%
	Average:	-1.7%	1.9%	3.7%	-4.4%	2.3%	-3.3%	-3.0%	-1.8%

30-day avg concentration decrease ≥ 5%
30-day avg concentration increase ≥ 5%
Exceeds TMDL Endpoint

Table 7.2 Comparison of the TMDL and near-term 2055 scenario water column results (maximum 30-day average concentration) for the tidal Anacostia River by verification unit and toxicant.

2055 Climate Change Scenario	Pollutant:	Arsenic	Heptachlor epoxide	Chlordane	Dieldrin	DDT	PAH 2	PAH 3	
	TMDL Endpoint (µg/l):	0.14	3.20E-05	3.20E-04	1.20E-06	1.80E-05	1.30E-03	1.30E-04	
	Verification Unit	Change in Maximum 30-day Average Concentration (%)							Average:
Upstream	Anacostia #2-10	0.3%	4.6%	3.9%	-9.5%	3.3%	-5.5%	-5.0%	-2.4%
	Anacostia #2-9	-2.8%	4.6%	4.0%	-12.7%	3.4%	-10.7%	-10.2%	-4.9%
	Anacostia #2-8	-5.7%	4.3%	3.8%	-14.2%	3.3%	-13.1%	-12.6%	-5.8%
	Kingman Lake-2	-1.2%	4.7%	4.3%	-8.2%	3.9%	-0.3%	-1.5%	-2.0%
	Anacostia #2-7	-7.5%	5.6%	5.0%	-13.8%	4.4%	-12.6%	-12.2%	-5.8%
	Anacostia #2-6	-7.1%	3.2%	6.6%	-11.5%	5.9%	-10.5%	-9.4%	-5.1%
	Kingman Lake-1	-4.0%	6.7%	6.2%	-11.2%	5.7%	-6.7%	-6.7%	-4.3%
	Anacostia #2-5	-6.4%	2.2%	6.4%	-10.3%	5.8%	-8.7%	-7.5%	-4.6%
	Anacostia #2-4	-4.9%	1.9%	5.9%	-9.7%	5.3%	-7.3%	-6.8%	-3.8%
	Anacostia #2-3	-4.4%	1.0%	5.8%	-9.2%	3.6%	-7.5%	-6.8%	-4.0%
	Anacostia #2-2	-3.9%	0.4%	5.8%	-9.0%	2.3%	-7.3%	-6.6%	-3.9%
	Anacostia #2-1	-3.4%	-0.2%	5.9%	-8.7%	0.6%	-6.9%	-6.3%	-3.9%
	Anacostia #1-2	-2.1%	-0.8%	6.4%	-7.8%	-0.2%	-6.0%	-5.4%	-3.1%
Downstream	Anacostia #1-1	-0.4%	**6.3%**	6.3%	-1.9%	0.0%	-2.7%	-2.4%	0.4%
	Average:	-2.9%	3.2%	**5.2%**	-8.9%	3.4%	-6.5%	-6.1%	-3.1%

30-day avg concentration decrease ≥ 5%
30-day avg concentration increase ≥ 5%
Exceeds TMDL Endpoint

7.2.2 Impacts of Climate Change on Natural Attenuation of Bed Sediments

The attenuation timeframes predicted under each of the two climate change scenarios are compared to the attenuation timeframes predicted under the 2014-2017 TMDL allocation scenario to see what the effects of climate change will be on the TMDL allocation scenario and predicted water quality attainment (Tables 6-1 and 6-2.

Across the toxic pollutant groups, there is a negligible change in the duration of natural attenuation of bed sediments, except in the Kingman Lake and Anacostia 1-1 (at the confluence of Potomac River). In particular, pollutant concentrations in bed sediment in the lower verification unit of Kingman Lake (Kingman Lake-1) attenuate more rapidly in both 2035 and 2055 scenarios, whereas concentrations in the Anacostia 1-1 verification unit attenuate more slowly. Greater detail on this analysis can be found in Appendix B (Tetra Tech, 2023a).

Table 7.3 Change in Attenuation Period for the 2035 Climate Change Scenario (years; negative indicates faster attenuation vs. TMDL, positive indicates slower attenuation).

		2035 Climate Change Scenario: Change in Attenuation Period (years: negative indicates faster attenuation vs. TMDL, positive: indicates slower attenuation)						
	Verification Unit	Arsenic	Heptachlor epoxide	Chlordane	Dieldrin	DDT	PAH 2	PAH 3
Upstream	Anacostia #2-10	0	0	-1	0	0	0	0
	Anacostia #2-9	0	0	-1	0	-1	0	-1
	Anacostia #2-8	1	1	0	0	1	1	1
	Kingman Lake-2	-2	0	0	-2	-1	-1	-2
	Anacostia #2-7	0	-1	-1	-1	-1	0	0
	Anacostia #2-6	-3	-1	-1	-3	-2	1	-3
	Kingman Lake-1	-22	-19	-23	-3	-15	-20	-25
	Anacostia #2-5	-1	-1	-1	0	-1	-2	-1
	Anacostia #2-4	-1	0	-2	0	0	1	-1
	Anacostia #2-3	0	1	4	2	0	0	2
	Anacostia #2-2	-9	0	-2	-1	-1	-1	-1
	Anacostia #2-1	-3	-3	0	-2	-2	0	-4
	Anacostia #1-2	1	0	1	1	-1	3	1
Downstream	Anacostia #1-1	5	1	2	2	1	-5	1

≥ 5 Additional years to achieve bed sediment target

≥ 5 Fewer years to achieve bed sediment target

≥ 10 Fewer years to achieve bed sediment target

≥ 20 Fewer years to achieve bed sediment target

Table 7.4 Change in Attenuation Period for the 2055 Climate Change Scenario (years; negative indicates faster attenuation vs. TMDL, positive indicates slower attenuation).

		2055 Climate Change Scenario: Change in Attenuation Period (years: negative indicates faster attenuation vs. TMDL, positive: indicates slower attenuation)						
	Verification Unit	Arsenic	Heptachlor epoxide	Chlordane	Dieldrin	DDT	PAH 2	PAH 3
Upstream	Anacostia #2-10	0	0	-1	-1	-1	0	0
	Anacostia #2-9	-1	0	-1	0	-2	-1	-1
	Anacostia #2-8	2	1	2	2	3	2	2
	Kingman Lake-2	-2	-1	-1	2	-1	-2	-2
	Anacostia #2-7	-1	-1	-1	-1	-1	-1	-1
	Anacostia #2-6	-5	-2	-1	-3	-4	-3	-5
	Kingman Lake-1	-36	-19	-16	-22	-22	-33	-31
	Anacostia #2-5	-1	0	-1	-1	-2	-3	-2
	Anacostia #2-4	2	1	4	2	4	1	1
	Anacostia #2-3	1	0	3	2	0	1	0
	Anacostia #2-2	-8	0	2	1	0	0	0
	Anacostia #2-1	1	-1	-1	0	2	8	-2
	Anacostia #1-2	5	2	4	4	3	6	8
Downstream	Anacostia #1-1	8	4	10	8	2	-1	5

≥ 5 Additional years to achieve bed sediment target

≥ 5 Fewer years to achieve bed sediment target

≥ 10 Fewer years to achieve bed sediment target

≥ 20 Fewer years to achieve bed sediment target

7.3 Climate Change Scenario Discussion

After considering the impacts of climate change under the TMDL allocation scenario on predicted toxic water column concentrations within the Anacostia River and natural attenuation timeframes, DOEE has determined, based on the analyses undertaken, that climate change is not predicted to have a significant enough impact on water quality following achievement of the TMDL allocations to warrant revisions to those TMDL allocations. Notably, there is a significant amount of uncertainty associated with future water quality predictions due to climate change. Therefore, revising TMDL allocations to account for the uncertain, predicted increase in toxic water column concentrations of less than 10 percent in only a few verification unit/pollutant combinations is not warranted.

Regarding predicted toxic water column concentrations, most verification units-pollutant combinations show a decrease in predicted toxic water column concentrations under both climate change scenarios (Tables 7-1 and 7-2). While some verification unit-pollutant combinations show an increase in predicted toxic water column concentrations under the climate change scenarios (particularly for heptachlor epoxide, DDT and its metabolites, and chlordane), most increase less than 5 percent, with the greatest increase being 6.7 percent for those particular pollutants. Furthermore, Table 7-2 shows that only one verification unit-pollutant combination (in the Lower Anacostia for heptachlor epoxide in the 2055 climate change scenario) exceeded its TMDL endpoint under the TMDL allocation scenario. This verification unit exceedance does not necessitate revisions to the TMDL allocations because revising TMDL allocations to account for the uncertain, predicted increase in toxic water column concentrations of less than 10 percent, but above the TMDL endpoint, in only one verification unit/pollutant combination is not warranted.

Other reasons for not revising the TMDL allocations include:

1. The TMDL scenario does not account for the on-the-ground changes due to the operation of the Anacostia River Tunnel System (installed March 2018 and September 2023); therefore, the simulated increase of pesticides due to increased CSS contributions may be prevented to a certain extent by the operation of the tunnel system;
2. The TMDL scenario does not account for in-stream remediation efforts at hotspots of toxic pollutant contamination in the Anacostia River mainstem due to the ARSP, and it is expected that in-stream remediation could result in decreases of these TMDL pollutants in the sediment that are concomitant with pollutants of concern for the ARSP;
3. The predicted increase in heptachlor epoxide water column concentrations due to climate change is only 6.3%; and,
4. It is reasonable to expect that additional time for natural attenuation (i.e., more than what is already called for in that assessment unit's 2055 scenario (37 years)) will result in achievement of the TMDL endpoint in that verification unit.

Regarding predicted timeframes of natural attenuation of toxic pollutants in bed sediment under the climate change scenarios, while the 2055 climate change scenario led to some verification unit-pollutant combinations taking more time (up to 10 years longer) to achieve water quality targets after TMDL allocations were achieved, overall, it is expected that the timeframes for most verification unit-pollutant combinations to achieve water quality targets will not be significantly impacted by climate change (less than five-year difference from the TMDL allocation scenario). Many of these verification unit-pollutant combinations were predicted to achieve water quality targets in less time (up to 36 fewer years) under the climate change scenarios, particularly those in Kingman Lake, which called for the largest natural attenuation timelines under the TMDL allocation scenario.

In summary, although climate change is expected to result in a greater load of toxic pollutants to the Anacostia River due to increased precipitation and associated runoff, the dilution of these toxic pollutants due to sea level rise and other hydrologic functions counteracts the increased load and results in minimal impact from climate change under the TMDL scenario. As a result, DOEE has not proposed revisions to the TMDL allocations to account for the uncertain, predicted impacts of climate change.

8 PUBLIC PARTICIPATION

The availability of draft TMDLs was advertised in the D.C. Register on September 8, 2023. The electronic documents were also posted on DOEE's internet site at https://doee.dc.gov/release/public-comment-revised-tmdl-organics-metals-anacostia. Interested parties were invited to submit comments during the public comment period, which began on September 8, 2023, and ended on October 23, 2023.

A previous public comment period was advertised in the D.C. Register beginning on July 9, 2021. The electronic documents were also posted on DOEE's internet site. Interested parties were invited to submit comments during the public comment period, which began on July 9, 2021 and ended on August 13, 2021. In addition to the formal public comment period, DOEE, EPA, and Tetra Tech held a public meeting with support from MWCOG on July 22, 2021, to provide an overview of the draft TMDLs to the public.

Furthermore, DOEE presented on TMDL development progress to the MWCOG's AWRP on September 25, 2018. Attendees included federal, state, and local government agencies as well as local non-profit environmental organizations. DOEE also provided brief updates on TMDL development at several AWRP Management Committee and Anacostia Toxic Source Workgroup meetings, on November 27, 2018, June 6, 2019, June 27, 2019, and March 8, 2021.

DOEE responded to all written comments received during both public comment periods upon final submission to EPA. Responses to public comments are included in Appendix C.

9 REASONABLE ASSURANCE FOR TMDL IMPLEMENTATION

Section 303(d) of the Clean Water Act (CWA) requires that a TMDL be "established at a level necessary to implement the applicable water quality standard". According to 40 C.F.R. § 130.2(i), "[i]f best management practices or other nonpoint source pollution controls make more stringent load allocations practicable, then wasteload allocations can be made less stringent". Providing reasonable assurance that nonpoint source control measures will achieve expected load reductions increases the probability that the pollution reduction levels specified in the TMDL will be achieved and, therefore, applicable WQS will be attained.

When a TMDL is developed for waters impaired by point sources, the issuance of a NPDES permit(s) provides the reasonable assurance that the wasteload allocations contained in the TMDL will be achieved. This is because 40 C.F.R. § 122.44(d)(1)(vii)(B) requires that effluent limits in permits be consistent with "the assumptions and requirements of any available wasteload allocation" in an EPA-approved TMDL. For example, permit limits consistent with the assumptions and requirements of the WLAs assigned in this TMDL will be incorporated in reissued permits for the four individual NPDES permitted facilities: DC Water Outfall 019 (DC0021199), Super Concrete (DC0000175), WNY (DC0000141), and PEPCO (DC0000094).

9.1 Point Source Reductions

9.1.1 MS4 Load Reductions

As part of the NPDES permit requirements, the District MS4 program is required to develop a TMDL implementation plan. In July 2016, the District submitted the DC Total Maximum Daily Load (TMDL) Consolidated Implementation Plan to EPA, hereinafter referred to as the DC TMDL-CIP. Because the original Anacostia River toxic pollutants TMDLs were approved by EPA in 2003, the DC TMDL-CIP incorporates the below activities, which work to address toxic contamination. Further, the District updated its TMDL-CIP in 2022. The updated plan includes new information related to WLAs, achievement of existing programmatic milestones, and attainment strategies for future implementation (DOEE, 2022c).

In both plans, there are several ongoing initiatives throughout the District to reduce stormwater runoff, which in turn, will reduce arsenic, chlordane, DDT and its metabolites, dieldrin, heptachlor epoxide, PAH 2, and PAH 3 in the Anacostia River. Because the toxic pollutants bind to sediment and are transported to the Anacostia River and its tributaries during rain events, reducing stormwater runoff represents an effective strategy for the DC MS4 to reduce toxic contamination. The centerpiece of these stormwater runoff initiatives is captured in the DC TMDL-CIP and includes through regulations the retention of 1.2" rain events from new development and redevelopment projects. The impact of these regulations will be amplified through the District's direct investment in green infrastructure and programs to promote voluntary retrofits of stormwater control measures, expansion of the urban tree canopy, and incorporation of green infrastructure features into the District capital projects, which are all programs that will all aid in reducing toxic contamination. For example, DOEE's 2022 plan cites 5-year numeric milestones in the District's MS4 permit that include 307 acres managed in the Anacostia watershed. Acres managed is the land treated by stormwater control measures to the applicable standards in the permit. In the Anacostia watershed, the District totaled 658 acres managed for the 2016-2020 period, more than the 307 acres managed required in the permit (DOEE, 2022d). Increases in acres managed will reduce runoff, thereby reducing the amount of toxic pollutants from the watershed that enter the Anacostia River.

Under the MS4 Permit, the District implements several stormwater management and source control activities, including illicit discharge detection and elimination, enhanced street sweeping, construction site and industrial facility inspections and enforcement, and household hazardous waste collections. Implementation approaches, including BMPs that reduce pollutant loading, such as installing bioretention systems and green roofs, and other pollution reduction measures, such as street sweeping, erosion and sediment control, and planting trees, will be effective in reducing stormwater runoff and associated pollutant loads, including the toxic pollutants addressed in these TMDLs. These practices can also help mitigate the effect of climate change. Through 2020, there have been approximately 2,000 bioretention and 430 green roof BMPs installed in the MS4 area (DOEE, 2022d). The 2021 annual report for the MS4 permit identified approximately 412,000 square feet of green roof was added, 6,100 miles of streets were swept, and 8,200 trees were planted in 2021 (DOEE, 2022d). For the same report year, 65 illicit discharges were detected and 63 discharges to the MS4 permit area were eliminated. Additional information on current practices and future measures to managing stormwater runoff can be found in the District's revised Stormwater Management Plan that was published in 2022 (DOEE, 2022c).

In addition to these BMPs typically designed for developed areas, DOEE's Watershed Protection Division has developed and implemented several projects in the Anacostia watershed (e.g., Kingman Lake, Nash Run, and Pope Branch stream restoration) to restore damaged riparian areas and to educate the public on the role of riparian buffers in reducing pollution. These efforts directly support the implementation of these TMDLs in less developed areas such as the subwatersheds east of the river by reducing pollutant loading from stormwater and sediment. Since the publication of the 2016 plan, several new restoration projects were installed in the Anacostia watershed. In 2017, restoration projects in Hickey Run and along Texas Avenue resulted in restoring 6,800 feet of stream length (DOEE, 2022d). These restoration activities, and planned future restoration activities, mitigate the effects of both climate change and stormwater runoff that can include pollutants established in TMDLs herein.

Under the Comprehensive Stormwater Management Enhancement Amendment Act of 2008, it is illegal to sell, use, or permit the use of coal tar pavement products in the District. Later in 2019, the Limitations on Products Containing Polycyclic Aromatic Hydrocarbons Amendment Act of 2018 expanded the law to include sealants containing steam cracked asphalt and any other products with PAH concentrations greater than 0.1 percent by weight on the list of banned sealant products. Violators of this ban are subject to a daily fine of up to $2,500. Contractors, property owners, and businesses that sell pavement sealant are regulated by the law. DOEE routinely inspects properties for compliance and there is a coal tar tip form that can be filled out online if a violation is suspected. DOEE inspects at least 60 properties per year for compliance with the ban. Recently, DOEE completed about 110 inspections (DOEE, 2022d). It is expected that PAH concentrations across the District will decrease as result of these bans, decreasing the amount entering surface waters from stormwater runoff across the watershed.

Also, if it is determined that the applicable BMPs are not being implemented or DOEE finds that individual sites or facilities are causing pollution, DOEE may take enforcement actions to achieve compliance with the District's WQS. The combination of both BMP implementation and other control and enforcement measures should continue to reduce arsenic, chlordane, DDT and its metabolites, dieldrin, heptachlor epoxide, PAH 2, and PAH 3 in the District's waters.

9.1.2 CSS Load Reductions

To comply with its Long-Term Control Plan (LTCP), DC Water is implementing the DC Clean Rivers Project, a large (about $2.7 billion) infrastructure project to upgrade the District's water and sewer systems to reduce nutrient discharges and CSOs to local rivers. The Clean Rivers Project is comprised of a variety of projects to control CSOs, including pumping station rehabilitations, green infrastructure, and a system of underground storage and conveyance tunnels. Construction of a 2.4 mile-long storage and conveyance tunnel for the Anacostia River (the Anacostia River Tunnel) was completed in March 2018. Between March 2018 and early December 2019, the Anacostia River Tunnel System captured about 7 billion gallons of combined sewer overflow (about 90 percent capture rate of CSOs). Through November 2022, the tunnel system captured about 1.5 billion gallons of CSO (reducing the CSO volume discharged to the Anacostia River by about 93 percent). A second tunnel in the Anacostia watershed, the Northeast Boundary Tunnel was completed in September 2023. The overall Anacostia River Tunnel System is expected to capture 98 percent of the CSO volume that would have otherwise entered the Anacostia River and instead treat that water at the Blue Plains Advanced Wastewater Treatment Plant. The tunnel system will also reduce the loadings of toxic pollutants that would otherwise enter the Anacostia River via stormwater runoff.

9.2 Nonpoint Source Reductions

Reasonable assurance that nonpoint source control measures will achieve expected load reductions increases the probability that the pollution reduction levels specified in the TMDL will be achieved and, therefore, applicable WQS will be attained.

Load allocations to nonpoint sources within the District are prescribed only for the identified contaminated sites. The remediation of the legacy contaminated sites (Table 3-1), several of which are federal facilities, in the Anacostia River watershed will result in a reduction of toxic pollutant loads to the Anacostia River. For example, environmental investigations at Poplar Point found that soil was contaminated with metals, pesticides, PCBs, and PAHs. A RI and a FS are being conducted at Poplar Point by the District with oversight from the National Park Service. RI activities began in 2018 and the final RI report and FS are scheduled to be completed in March 2024 and December 2024, respectively. The Proposed Plan and ROD will follow in the future years. It is expected that the plan will decrease toxic loads from the site and make progress towards achieving the TMDL endpoints. Other site studies that may aid in achievement of TMDL endpoints include ongoing work at PEPCO, Washington Gas and Light East Station, and WNY. These sites are being investigated under legal agreements. In addition, clean up at CSX Benning Yard is covered by a separate legal agreement and that work may result in reducing toxic pollutant loads to the river.

For areas that do not have ongoing studies, the ARSP Interim ROD (see Section 9.2) has identified 11 early action areas where PCB and associated pollutant (e.g., chlordane) contamination will be reduced using carbon amendments, dredging, and capping of contaminated sediments. DOEE is undertaking remediation in accordance with the District's Brownfields Revitalization Amendment Act, the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the National Oil and Hazardous Substances Pollution Contingency Plan (DOEE, 2020a).

9.3 Chesapeake Bay Agreement and TMDL

A new Chesapeake Bay Watershed Agreement was signed on June 16, 2014, which includes goals and outcomes for mitigation and ultimate elimination of toxic contaminants in the Chesapeake Bay watershed (CBP, 2014). The toxic contaminant goal is to "ensure that the Bay and its rivers are free of effects of toxic contaminants on living resources and human health" (CBP, 2014). Objectives for the toxic contaminant outcomes regarding PCBs or pesticides include 1) characterizing the occurrence, concentrations, sources, and effects of PCBs, 2) identifying BMPs that may provide benefits for reducing toxic contaminants in waterways, 3) improving practices and controls that reduce and prevent effects of toxic contaminants, and 4) building on existing programs to reduce the amount and effects of PCBs in the Bay and watershed. Implementation of the toxic contaminant goal and outcomes under the new Bay agreement would aid attainment of the TMDL endpoints established herein.

The climate resiliency goal of the Chesapeake Bay Watershed Agreement is to "increase the resiliency of the Chesapeake Bay watershed, including its living resources, habitats, public infrastructure and communities, to withstand adverse impacts from changing environmental and climate conditions" (CBP, 2014). This goal addresses the impact that climate change may have on aquatic systems and acknowledges that climate change must be considered to achieve the other Watershed Agreement goals, like the toxic contaminant goal.

The Chesapeake Bay Program (CBP) also promotes water quality improvements in many ways, including monitoring, publishing water quality studies, supporting studies on or providing framework for managing toxic chemicals, and hosting numerous workshops on water quality-related issues. CBP's continued actions related to toxics contaminants will further aid progress towards the attainment of water quality goals in the Anacostia River.

In 2019, DOEE released the "District of Columbia's Phase III Watershed Implementation Plan for the Chesapeake Bay" (WIP). In that plan, the District included actions to further reduce pollution and address the impacts of climate change on water quality in District waters by 2025. For example, DOEE is in the process of revising its floodplain regulations to increase the District's resilience and account for sea level rise. Another example is assessing stormwater performance standards considering future precipitation scenarios under the NPDES permit. The plan also noted that, in anticipation of more extreme weather events associated with climate change, the Phase III WIP loads for DC Water's Blue Plains was based on design capacity rather than current flows. The District was the first jurisdiction among Bay jurisdictions (i.e., Maryland, West Virginia, New York, Delaware, Virginia, and Pennsylvania) to commit to reduce additional pollutant loads (6,000 pounds of nitrogen and 1,028 pounds of phosphorus), associated with climate change as part of its Phase III WIP (DOEE, 2019). Practices, projects, and programs that reduce nitrogen and pollutant loads can also reduce the pollutant load associated with metals and toxic contaminants established in this TMDL.

The Chesapeake Bay TMDL is implemented using an accountability framework that includes short-term goals for each jurisdiction that are called milestones. The milestones help ensure progress toward having pollution reduction measures in place to restore the Bay and its tidal rivers (EPA, 2023). The District's updates to the 2020-2021 milestones included a review of performance standards related to future storms affected by climate change. The District's 2022-2023 milestone commitments include incorporating new design changes for stormwater BMPs to account for increases in storm size and initiating potential regulatory changes to the District's two- and five-year peak discharge requirements in the District's stormwater performance standards that consider both quantity and quality of stormwater runoff (DOEE, 2022a). The practices that are used to prevent, reduce, and treat increases in runoff and associated pollutant loads due to climate change can also reduce the loads associated with metals and toxic contaminants in this TMDL.

9.4 Anacostia River Sediment Project

DOEE's ARSP, which includes about nine miles of the tidal portion of the Anacostia River, identified sediment contamination in the tidal Anacostia River, Kingman Lake, and Washington Channel. DOEE is remediating the river under the District's Brownfields Revitalization Amendment Act, which requires that DOEE select a remedy in accordance with CERCLA, and the National Contingency Plan. The ARSP study area, however, is not a CERCLA site.

Earlier phases of the ARSP included a Remedial Investigation and Feasibility Study (RI/FS). Through the RI, it was determined that elevated concentrations of contaminants, specifically PCBs (but also included PAHs, dioxins, heavy metals, and pesticides) from industrial, urban, and human activities exist in sediment throughout the Anacostia River. After feedback from stakeholders on the proposed plan, DOEE released the Interim Record of Decision (ROD) in September 2020. This Interim ROD identifies and describes early actions to clean up hotspots (i.e., the areas most contaminated by PCBs in the river). The Interim ROD estimates that cleaning up the 11 early action areas will greatly reduce contamination in the system. The ROD, however, also targets other contaminants in addition to PCBs, specifically dioxin, chlordane, and dioxin-like PCBs. Areas will be remediated through a combination of carbon amendments, capping, and sediment dredging, and progress determined through post-remedial monitoring. It is expected that the remediation efforts will begin in Washington Channel in 2025, the Anacostia River mainstem in 2026 and Kingman Lake in 2026. Estimated costs for remediating those areas is, at a minimum, $50 million. More information can be found on the ARSP website: Anacostia River Sediment Project.

Remediation of the PCB hotspots is also expected to reduce other pollutants (e.g., metals, organochlorine pesticides, and PAHs) that coexist in the PCB-contaminated sediment. It is reasonable to conclude that the remediation of contaminated sediment at the 11 early actions areas will decrease the time it will take for water quality to approach the TMDL endpoints.

9.5 Monitoring

DOEE will perform post-TMDL monitoring to refine its understanding regarding the contribution of each of the addressed pollutants (i.e., arsenic, chlordane, DDT and its metabolites, dieldrin, heptachlor epoxide, PAH 2, and PAH 3) from each source to improve control actions and management. DOEE will compile and analyze the monitoring data to evaluate progress toward attaining the TMDL endpoints. Post-TMDL monitoring will help DOEE determine whether planned control actions are performing as intended, or whether further measures need to be implemented.

DOEE monitors the concentrations of arsenic, chlordane, DDT and its metabolites, dieldrin, heptachlor epoxide, PAH 2, and PAH 3 as well as many other pollutants, in fish tissue approximately every 2-3 years, and utilizes the results to determine use support for Class D Waters (protection of human health, as it relates to fish consumption) and to develop new or update existing fish consumption advisories, if necessary. DOEE partners with the U.S. Fish and Wildlife Service to conduct fish tissue monitoring and the most recent study, was completed in summer 2023. As the consumption of contaminated fish is the main pathway for these toxic pollutants to impact human health, DOEE is committed to continuing to conduct fish tissue studies for toxic pollutants.

Post-TMDL monitoring will provide important information to stakeholders and District residents regarding public health. Also, given that the legacy pollutants are no longer actively used in the District and are expected to decline over time, data will be analyzed to assess trends and/or progress toward the TMDL endpoints for those pollutants. Concurrently, DOEE is supporting local, citizen-led monitoring programs that will provide a further efficient and comprehensive means to monitor measurable reductions to loadings. The District has robust local, regional, and national stakeholders and watershed groups that share a common goal to protect and restore water quality. These groups have the capacity to, and often do, conduct watershed outreach and education activities, monitoring, research, and advocacy for implementation of water-quality improvements, such as TMDLs. Activities and engagement conducted by these stakeholders provide additional assurance that implementation will continue to occur to address nonpoint sources of pollution generally, including the toxic pollutants addressed in these TMDLs.

For the Anacostia River Sediment Project (ARSP), DOEE will implement baseline and performance monitoring for early action areas (hot spots) in the Anacostia River Mainstem, Kingman Lake, and Washington Channel. The interim remedy will remediate sediment with the highest concentrations of PCBs in the river. The baseline monitoring targets four constituents of concern in sediment that pose a risk to human health or to ecological receptors: total PCB congeners (human health), dioxin toxic equivalent (TEQ) (ecological), chlordane (ecological), and dioxin-like PCB TEQ (human health and ecological). The Baseline and Performance Monitoring Plan addresses these contaminants of concern as well as PAHs. Pre-remediation monitoring will evaluate baseline conditions before remedial action is implemented, and post-remedial or long-term monitoring will be conducted to assess the effectiveness of remedial actions after they are implemented.

The Baseline and Performance Monitoring Plan establishes protocols for collecting and analyzing data on multiple indicators that will be used to evaluate progress toward the achievement of the Remedial Action Objectives of the ARSP. The monitoring program will measure surface sediment, porewater, surface water, benthic, and forage and game fish. The indicators will be sampled every two to three years for contaminants of concern until pollutant reduction goals are met for three consecutive periods. Forage and game fish tissue will also be sampled every three years until pollutant reduction goals are met for three consecutive periods. The surface water monitoring results will inform DOEE’s bioaccumulation and ARSP surface water models (Tetra Tech, 2019).

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APPENDIX A: UNIMPAIRED SEGMENTS

TMDLs and associated allocations are presented for the below unimpaired waterbody-pollutant combinations for all seven toxic pollutants in the District as well as three other toxic pollutants that are not listed as impaired (copper, zinc, PAH 1). These unimpaired waters do not require TMDLs under EPA's implementing regulations (40 C.F.R. § 130.7) because they are not listed as impaired on the District's Integrated Report (DOEE, 2024) for the associated pollutants. However, DOEE chose to establish informational TMDLs for these waters. Furthermore, the source-specific allocations presented below are incorporated into the TMDLs provided in Section 6 of the TMDL report because those allocations are required to meet downstream water quality in the tidal mainstem Anacostia River.

Informational Total Maximum Daily Load Tables for Unimpaired Segments

Table A-1 Informational Daily Loads for Unimpaired Segments for Arsenic

Segment	Source	TMDL (g/day)
Hickey Run[1]	MS4	15.76
	MSGP	1.58
	Point Sources/WLAs	**17.34**
	Total Hickey Run	**17.34**
Popes Branch[1]	MS4	6.34
	Point Sources/WLAs	**6.34**
	Total Popes Branch	**6.34**

[1]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table A-2 Informational Daily Loads for Unimpaired Segments for Copper

Segment	Source	TMDL (g/day)
Nash Run	MD Upstream Load[1]	1086.07
	Contaminated Sites	40.31
	Nonpoint Sources/LAs	**1126.38**
	MS4	2198.71
	Point Sources/WLAs	**2198.71**
	Total Nash Run	**3325.09**
Hickey Run[2]	MS4	4982.18
	MSGP	528.98
	Point Sources/WLAs	**5511.16**
	Total Hickey Run	**5511.16**
Watts Branch[3]	MD Upstream Load[1]	4115.19

	Contaminated Sites	41.83
	Nonpoint Sources/LAs	**4157.02**
	MS4	4878.27
	Pepco (DC0000094)[4]	12.94
	Point Sources/WLAs	**4891.21**
	Total Watts Branch	**9048.23**
Kingman Lake[2]	MS4	3241.45
	Point Sources/WLAs	**3241.45**
	Total Kingman Lake	**3241.45**
Fort Chaplin Run[2]	MS4	1502.56
	Point Sources/WLAs	**1502.56**
	Total Fort Chaplin Run	**1502.56**
Fort Dupont Creek	Contaminated Sites	29.34
	Nonpoint Sources/LAs	**29.34**
	MS4	2697.59
	Point Sources/WLAs	**2697.59**
	Total Fort Dupont Creek	**2726.92**
Popes Branch[2]	MS4	1557.63
	Point Sources/WLAs	**1557.63**
	Total Popes Branch	**1557.63**
Fort Davis Tributary[2]	MS4	1201.46
	Point Sources/WLAs	**1201.46**
	Total Fort Davis Tributary	**1201.46**
Texas Avenue Tributary[2]	MS4	1269.53
	Point Sources/WLAs	**1269.53**
	Total Texas Avenue Tributary	**1269.53**
Anacostia #2[5]	Upstream Loads	
	MD Upstream Load[6]	1.04E+06
	DC Point Source	
	Super Concrete (DC0000175)[7]	1.61E+03
	Cumulative Load from Tributaries	2.09E+04
	Load from Kingman Lake	3241.45
	Cumulative Upstream Load	**1.06E+06**
	Anacostia #2 Direct Drainage	
	Contaminated Sites	572.64
	Nonpoint Sources/LAs	**572.64**
	Anacostia #2 Direct Drainage	
	MS4	1.43E+05
	MSGP	3129.14
	Pepco (DC0000094)[4]	774.33
	Point Sources/WLAs	**1.47E+05**

	Total Anacostia #2	**1.21E+06**
Fort Stanton Tributary[2]	MS4	850.50
	Point Sources/WLAs	**850.50**
	Total Fort Stanton Tributary	**850.50**
Anacostia #1[8]	Upstream Loads	
	Cumulative Load from Anacostia #2	1.21E+06
	Cumulative Load from Tributaries	850.50
	Cumulative Upstream Load	**1.21E+06**
	Anacostia #1 Direct Drainage	
	Contaminated Sites	5553.37
	Nonpoint Sources/LAs	**5553.37**
	Anacostia #1 Direct Drainage	
	CSS	1.37E+05
	MS4	2.54E+05
	MSGP	8884.99
	DC Water Outfall 019 (DC0021199)	5.93E+04
	Washington Navy Yard (DC0000141)[4]	3483.29
	Point Sources/WLAs	**4.63E+05**
	Total Anacostia #1	**1.68E+06**

[1]Upstream loads from the MD portion of the watershed.

[2]No LA is presented for these segments because all stormwater runoff is captured by the MS4.

[3]DC delineates Watts Branch as two assessment units, but for the purposes of this TMDL, Watts Branch #1 and #2 were combined.

[4]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.

[5]Loads presented for the Anacostia #2 segment are cumulative. The loads for Anacostia #2 include loads from MD Anacostia Tidal Segment, Kingman Lake, tributaries to Anacostia #2, and direct drainage.

[6]Upstream loads from MD include loads from the MD Anacostia Tidal Segment watershed comprising the Northeast Branch, Northwest Branch, and direct drainage to the MD Anacostia Tidal Segment, as well as upstream loads from the MD portion of the Lower Beaverdam Creek, Watts Branch, and Nash Run which drain directly to DC waters.

[7]The WLA for Super Concrete (DC0000175), a DC NPDES point source, is presented as a component of the MD Upstream Load because its discharge enters an unnamed tributary in DC which then flows eastward across the DC/MD boundary and ultimately drains into the MD Northwest Branch. This WLA was inadvertently omitted from the allocation tables in earlier drafts of the TMDL Report but was reflected in the cumulative loads entering the Anacostia River mainstem in DC and individually in the TMDL allocation spreadsheets found in the Supporting Documents. The methodology to calculate the WLA for Super Concrete was described in earlier drafts of the TMDL Report and remains the same.

[8]Loads presented for the Anacostia #1 segment are cumulative. The loads for Anacostia #1 include cumulative loads from Anacostia #2, tributaries to Anacostia #1, and direct drainage.

Note 1: The MOS is implicit.

Note 2: Columns may not precisely add to totals due to rounding.

Table A-3 Informational Daily Loads for Unimpaired Segments for Zinc

Segment	Source	TMDL (g/day)
Nash Run	MD Upstream Load[1]	1298.90
	Contaminated Sites	169.18
	Nonpoint Sources/LAs	**1468.08**
	MS4	2449.72
	Point Sources/WLAs	**2449.72**
	Total Nash Run	**3917.80**
Hickey Run[2]	MS4	5312.11
	MSGP	618.95
	Point Sources/WLAs	**5931.06**
	Total Hickey Run	**5931.06**
Watts Branch[3]	MD Upstream Load[1]	4747.66
	Contaminated Sites	150.50
	Nonpoint Sources/LAs	**4898.16**
	MS4	5491.30
	Pepco (DC0000094)[4]	241.55
	Point Sources/WLAs	**5732.85**
	Total Watts Branch	**10631.00**
Kingman Lake[2]	MS4	3042.12
	Point Sources/WLAs	**3042.12**
	Total Kingman Lake	**3042.12**
Fort Chaplin Run[2]	MS4	1495.19
	Point Sources/WLAs	**1495.19**
	Total Fort Chaplin Run	**1495.19**
Fort Dupont Creek	Contaminated Sites	256.53
	Nonpoint Sources/LAs	**256.53**
	MS4	2198.98
	Point Sources/WLAs	**2198.98**
	Total Fort Dupont Creek	**2455.51**
Popes Branch[2]	MS4	1463.03
	Point Sources/WLAs	**1463.03**
	Total Popes Branch	**1463.03**
Fort Davis Tributary[2]	MS4	1184.34
	Point Sources/WLAs	**1184.34**
	Total Fort Davis Tributary	**1184.34**
Texas Avenue Tributary[2]	MS4	1264.35
	Point Sources/WLAs	**1264.35**

	Total Texas Avenue Tributary	**1264.35**
Anacostia #2[5]	Upstream Loads	
	MD Upstream Load[6]	9.84E+05
	DC Point Source	
	Super Concrete (DC0000175)[7]	1.24E+04
	Cumulative Load from Tributaries	2.23E+04
	Load from Kingman Lake	3.04E+03
	Cumulative Upstream Load	**1.01E+06**
	Anacostia #2 Direct Drainage	
	Contaminated Sites	1716.86
	Nonpoint Sources/LAs	**1716.86**
	Anacostia #2 Direct Drainage	
	MS4	1.32E+05
	MSGP	3238.74
	Pepco (DC0000094)[4]	1.07E+04
	Point Sources/WLAs	**1.46E+05**
	Total Anacostia #2	**1.16E+06**
Fort Stanton Tributary[2]	MS4	852.92
	Point Sources/WLAs	**852.92**
	Total Fort Stanton Tributary	**852.92**
Anacostia #1[8]	Upstream Loads	
	Cumulative Load from Anacostia #2	1.16E+06
	Cumulative Load from Tributaries	852.92
	Cumulative Upstream Load	**1.16E+06**
	Anacostia #1 Direct Drainage	
	Contaminated Sites	8.32E+03
	Nonpoint Sources/LAs	**8.32E+03**
	Anacostia #1 Direct Drainage	
	CSS	6.95E+04
	MS4	1.26E+05
	MSGP	4868.17
	DC Water Outfall 019 (DC0021199)	2.44E+05
	Washington Navy Yard (DC0000141)[4]	1.22E+04
	Point Sources/WLAs	**4.56E+05**
	Total Anacostia #1	**1.62E+06**

[1]Upstream loads from the MD portion of the watershed.
[2]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
[3]DC delineates Watts Branch as two assessment units, but for the purposes of this TMDL, Watts Branch #1 and #2 were combined.
[4]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.

[5]Loads presented for the Anacostia #2 segment are cumulative. The loads for Anacostia #2 include loads from MD Anacostia Tidal Segment, Kingman Lake, tributaries to Anacostia #2, and direct drainage.
[6]Upstream loads from MD include loads from the MD Anacostia Tidal Segment watershed comprising the Northeast Branch, Northwest Branch, and direct drainage to the MD Anacostia Tidal Segment, as well as upstream loads from the MD portion of the Lower Beaverdam Creek, Watts Branch, and Nash Run which drain directly to DC waters.
[7]The WLA for Super Concrete (DC0000175), a DC NPDES point source, is presented as a component of the MD Upstream Load because its discharge enters an unnamed tributary in DC which then flows eastward across the DC/MD boundary and ultimately drains into the MD Northwest Branch. This WLA was inadvertently omitted from the allocation tables in earlier drafts of the TMDL Report but was reflected in the cumulative loads entering the Anacostia River mainstem in DC and individually in the TMDL allocation spreadsheets found in the Supporting Documents. The methodology to calculate the WLA for Super Concrete was described in earlier drafts of the TMDL Report and remains the same.
[8]Loads presented for the Anacostia #1 segment are cumulative. The loads for Anacostia #1 include cumulative loads from Anacostia #2, tributaries to Anacostia #1, and direct drainage.

Note 1: The MOS is implicit.

Note 2: Columns may not precisely add to totals due to rounding.

Table A-4 Informational Daily Loads for Unimpaired Segments for Chlordane

Segment	Source	TMDL (g/day)
Nash Run	MD Upstream Load[1]	0.009
	Contaminated Sites	0.001
	Nonpoint Sources/LAs	**0.010**
	MS4	0.021
	Point Sources/WLAs	**0.021**
	Total Nash Run	**0.031**
Hickey Run[2]	MS4	0.043
	MSGP	0.004
	Point Sources/WLAs	**0.047**
	Total Hickey Run	**0.047**
Watts Branch[3]	MD Upstream Load[1]	0.047
	Contaminated Sites	0.001
	Nonpoint Sources/LAs	**0.049**
	MS4	0.049
	Pepco (DC0000094)[4]	0.001
	Point Sources/WLAs	**0.050**
	Total Watts Branch	**0.098**
Fort Chaplin Run[2]	MS4	0.012
	Point Sources/WLAs	**0.012**

	Total Fort Chaplin Run	**0.012**
Fort Dupont Creek	Contaminated Sites	0.001
	Nonpoint Sources/LAs	**0.001**
	MS4	0.019
	Point Sources/WLAs	**0.019**
	Total Fort Dupont Creek	**0.020**
Fort Davis Tributary[2]	MS4	0.009
	Point Sources/WLAs	**0.009**
	Total Fort Davis Tributary	**0.009**
Anacostia #2[5]	Upstream Loads	
	MD Upstream Load[6]	17.673
	DC Point Source	
	Super Concrete (DC0000175)[7]	0.039
	Cumulative Load from Tributaries	0.181
	Load from Kingman Lake	0.023
	Cumulative Upstream Load	**17.877**
	Anacostia #2 Direct Drainage	
	Contaminated Sites	0.030
	Nonpoint Sources/LAs	**0.030**
	Anacostia #2 Direct Drainage	
	MS4	2.322
	MSGP	0.043
	Pepco (DC0000094)[4]	0.065
	Point Sources/WLAs	**2.430**
	Total Anacostia #2	**20.336**
Fort Stanton Tributary[2]	MS4	0.005
	Point Sources/WLAs	**0.005**
	Total Fort Stanton Tributary	**0.005**

[1]Upstream loads from the MD portion of the watershed.
[2]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
[3]DC delineates Watts Branch as two assessment units, but for the purposes of this TMDL, Watts Branch #1 and #2 were combined.
[4]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.
[5]Loads presented for the Anacostia #2 segment are cumulative. The loads for Anacostia #2 include loads from MD Anacostia Tidal Segment, Kingman Lake, tributaries to Anacostia #2, and direct drainage.
[6]Upstream loads from MD include loads from the MD Anacostia Tidal Segment watershed comprising the Northeast Branch, Northwest Branch, and direct drainage to the MD Anacostia Tidal Segment, as well as upstream loads from the MD portion of the Lower Beaverdam Creek, Watts Branch, and Nash Run which drain directly to DC waters.

[7]The WLA for Super Concrete (DC0000175), a DC NPDES point source, is presented as a component of the MD Upstream Load because its discharge enters an unnamed tributary in DC which then flows eastward across the DC/MD boundary and ultimately drains into the MD Northwest Branch. This WLA was inadvertently omitted from the allocation tables in earlier drafts of the TMDL Report but was reflected in the cumulative loads entering the Anacostia River mainstem in DC and individually in the TMDL allocation spreadsheets found in the Supporting Documents. The methodology to calculate the WLA for Super Concrete was described in earlier drafts of the TMDL Report and remains the same.

Note 1: The MOS is implicit.

Note 2: Columns may not precisely add to totals due to rounding.

Table A-5 Informational Daily Loads for Unimpaired Segments for DDT and its Metabolites

Segment	Source	TMDL (g/day)
Nash Run	MD Upstream Load[1]	8.52E-04
	Contaminated Sites	0.0014
	Nonpoint Sources/LAs	**0.0022**
	MS4	0.0025
	Point Sources/WLAs	**0.0025**
	Total Nash Run	**0.0048**
Watts Branch[2]	MD Upstream Load[1]	0.0041
	Contaminated Sites	0.0012
	Nonpoint Sources/LAs	**0.0052**
	MS4	0.0041
	Pepco (DC0000094)[3]	0.0002
	Point Sources/WLAs	**0.0042**
	Total Watts Branch	**0.0095**
Fort Chaplin Run[4]	MS4	0.0009
	Point Sources/WLAs	**0.0009**
	Total Fort Chaplin Run	**0.0009**
Fort Dupont Creek	Contaminated Sites	1.91E-04
	Nonpoint Sources/LAs	**1.91E-04**
	MS4	0.0019
	Point Sources/WLAs	**0.0019**
	Total Fort Dupont Creek	**0.0021**
Fort Davis Tributary[4]	MS4	7.04E-04
	Point Sources/WLAs	**7.04E-04**
	Total Fort Davis Tributary	**7.04E-04**
Fort Stanton Tributary[4]	MS4	4.12E-04
	Point Sources/WLAs	**4.12E-04**
	Total Fort Stanton Tributary	**4.12E-04**

[1]Upstream loads from the MD portion of the watershed.

[2]DC delineates Watts Branch as two assessment units, but for the purposes of this TMDL, Watts Branch #1 and #2 were combined.
[3]The loads for this individual discharger include both the landbased load attributed to the contaminated land and the load attributed to its discharge.
[4]No LA is presented for these segments because all stormwater runoff is captured by the MS4.

Note 1: The MOS is implicit.

Note 2: Columns may not precisely add to totals due to rounding.

Table A-6 Informational Daily Loads for Unimpaired Segments for Dieldrin

Segment	Source	TMDL (g/day)
Hickey Run[1]	MS4	0
	MSGP	0
	Point Sources/WLAs	**0**
	Total Hickey Run	**0**
Fort Chaplin Run[1]	MS4	0
	Point Sources/WLAs	**0**
	Total Fort Chaplin Run	**0**
Fort Dupont Creek	Contaminated Sites	0
	Nonpoint Sources/LAs	**0**
	MS4	0
	Point Sources/WLAs	**0**
	Total Fort Dupont Creek	**0**
Fort Davis Tributary[1]	MS4	0
	Point Sources/WLAs	**0**
	Total Fort Davis Tributary	**0**
Fort Stanton Tributary[1]	MS4	0
	Point Sources/WLAs	**0**
	Total Fort Stanton Tributary	**0**

[1]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table A-7 Informational Daily Loads for Unimpaired Segments for Heptachlor Epoxide

Segment	Source	TMDL (g/year)
Hickey Run[1]	MS4	7.67E-03
	MSGP	7.74E-04
	Point Sources/WLAs	**8.45E-03**
	Total Hickey Run	**8.45E-03**
Watts Branch[2]	MD Upstream Load[3]	8.03E-03

	Contaminated Sites	1.95E-04
	Nonpoint Sources/LAs	**0.0082**
	MS4	8.25E-03
	Pepco (DC0000094)[4]	8.66E-05
	Point Sources/WLAs	**8.33E-03**
	Total Watts Branch	**0.0166**
Kingman Lake[1]	MS4	4.53E-03
	Point Sources/WLAs	**4.53E-03**
	Total Kingman Lake	**4.53E-03**
Fort Chaplin Run[1]	MS4	2.45E-03
	Point Sources/WLAs	**2.45E-03**
	Total Fort Chaplin Run	**2.45E-03**
Fort Dupont Creek	Contaminated Sites	1.42E-04
	Nonpoint Sources/LAs	**1.42E-04**
	MS4	3.94E-03
	Point Sources/WLAs	**3.94E-03**
	Total Fort Dupont Creek	**4.08E-03**
Fort Davis Tributary[1]	MS4	1.97E-03
	Point Sources/WLAs	**1.97E-03**
	Total Fort Davis Tributary	**1.97E-03**
Fort Stanton Tributary[1]	MS4	1.46E-03
	Point Sources/WLAs	**1.46E-03**
	Total Fort Stanton Tributary	**1.46E-03**

[1]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
[2]DC delineates Watts Branch as two assessment units, but for the purposes of this TMDL, Watts Branch #1 and #2 were combined.
[3]Upstream loads from the MD portion of the watershed.
[4]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table A-8 Informational Daily Loads for Unimpaired Segments for the PAH 1 Group

Segment	**Source**	**TMDL (g/day)**
Nash Run	MD Upstream Load[1]	9.54
	Contaminated Sites	6.17
	Nonpoint Sources/LAs	**15.71**
	MS4	17.71
	Point Sources/WLAs	**17.71**
	Total Nash Run	**33.42**

Hickey Run[2]	MS4	36.50
	MSGP	4.36
	Point Sources/WLAs	**40.87**
	Total Hickey Run	**40.87**
Watts Branch[3]	MD Upstream Load[1]	33.74
	Contaminated Sites	5.67
	Nonpoint Sources/LAs	**39.41**
	MS4	40.29
	Pepco (DC0000094)[4]	3.56
	Point Sources/WLAs	**43.85**
	Total Watts Branch	**83.26**
Kingman Lake[2]	MS4	18.31
	Point Sources/WLAs	**18.31**
	Total Kingman Lake	**18.31**
Fort Chaplin Run[2]	MS4	9.80
	Point Sources/WLAs	**9.80**
	Total Fort Chaplin Run	**9.80**
Fort Dupont Creek	Contaminated Sites	3.63
	Nonpoint Sources/LAs	**3.63**
	MS4	11.33
	Point Sources/WLAs	**11.33**
	Total Fort Dupont Creek	**14.96**
Popes Branch[2]	MS4	9.21
	Point Sources/WLAs	**9.21**
	Total Popes Branch	**9.21**
Fort Davis Tributary[2]	MS4	7.72
	Point Sources/WLAs	**7.72**
	Total Fort Davis Tributary	**7.72**
Texas Avenue Tributary[2]	MS4	8.30
	Point Sources/WLAs	**8.30**
	Total Texas Avenue Tributary	**8.30**
Anacostia #2[5]	Upstream Loads	
	MD Upstream Load[6]	6719.59
	DC Point Source	
	Super Concrete (DC0000175)[7]	778.41
	Cumulative Load from Tributaries	164.24
	Load from Kingman Lake	18.31
	Cumulative Upstream Load	**6902.15**
	Anacostia #2 Direct Drainage	
	Contaminated Sites	12.00
	Nonpoint Sources/LAs	**12.00**

	Anacostia #2 Direct Drainage	
	MS4	795.03
	MSGP	20.25
	Pepco (DC0000094)[4]	583.54
	Point Sources/WLAs	**1398.81**
	Total Anacostia #2	**8312.96**
Fort Stanton Tributary[2]	MS4	5.63
	Point Sources/WLAs	**5.63**
	Total Fort Stanton Tributary	**5.63**
Anacostia #1[8]	Upstream Loads	
	Cumulative Load from Anacostia #2	8312.96
	Cumulative Load from Tributaries	5.63
	Cumulative Upstream Load	**8318.59**
	Anacostia #1 Direct Drainage	
	Contaminated Sites	27.19
	Nonpoint Sources/LAs	**27.19**
	Anacostia #1 Direct Drainage	
	CSS	27.36
	MS4	49.27
	MSGP	2.02
	DC Water Outfall 019 (DC0021199)	4852.40
	Washington Navy Yard (DC0000141)[4]	9.07
	Point Sources/WLAs	**4940.12**
	Total Anacostia #1	**13285.90**

[1]Upstream loads from the MD portion of the watershed.
[2]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
[3]DC delineates Watts Branch as two assessment units, but for the purposes of this TMDL, Watts Branch #1 and #2 were combined.
[4]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.
[5]Loads presented for the Anacostia #2 segment are cumulative. The loads for Anacostia #2 include loads from MD Anacostia Tidal Segment, Kingman Lake, tributaries to Anacostia #2, and direct drainage.
[6]Upstream loads from MD include loads from the MD Anacostia Tidal Segment watershed comprising the Northeast Branch, Northwest Branch, and direct drainage to the MD Anacostia Tidal Segment, as well as upstream loads from the MD portion of the Lower Beaverdam Creek, Watts Branch, and Nash Run which drain directly to DC waters.

[7]The WLA for Super Concrete (DC0000175), a DC NPDES point source, is presented as a component of the MD Upstream Load because its discharge enters an unnamed tributary in DC which then flows eastward across the DC/MD boundary and ultimately drains into the MD Northwest Branch. This WLA was inadvertently omitted from the allocation tables in earlier drafts of the TMDL Report but was reflected in the cumulative loads entering the Anacostia River mainstem in DC and individually in the TMDL allocation spreadsheets found in the Supporting Documents. The methodology to calculate the WLA for Super Concrete was described in earlier drafts of the TMDL Report and remains the same.
[8]Loads presented for the Anacostia #1 segment are cumulative. The loads for Anacostia #1 include cumulative loads from Anacostia #2, tributaries to Anacostia #1, and direct drainage.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table A-9 Informational Daily Loads for Unimpaired Segments for the PAH 2 Group

Segment	Source	TMDL (g/day)
Watts Branch[1]	MD Upstream Load[2]	0.01
	Contaminated Sites	0
	Nonpoint Sources/LAs	**0.01**
	MS4	0
	Pepco (DC0000094)[3]	0
	Point Sources/WLAs	**0**
	Total Watts Branch	**0.01**
Fort Chaplin Run[4]	MS4	0
	Point Sources/WLAs	**0**
	Total Fort Chaplin Run	**0**
Fort Dupont Creek	Contaminated Sites	0
	Nonpoint Sources/LAs	**0**
	MS4	0
	Point Sources/WLAs	**0**
	Total Fort Dupont Creek	**0**
Fort Davis Tributary[4]	MS4	0
	Point Sources/WLAs	**0**
	Total Fort Davis Tributary	**0**

[1]DC delineates Watts Branch as two assessment units, but for the purposes of this TMDL, Watts Branch #1 and #2 were combined.
[2]Upstream loads from the MD portion of the watershed.
[3]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.
[4]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table A-10 Informational Daily Loads for Unimpaired Segments for the PAH 3 Group

Segment	Source	TMDL (g/day)
Watts Branch[1]	MD Upstream Load[2]	0.001
	Contaminated Sites	0
	Nonpoint Sources/LAs	**0.001**
	MS4	0
	Pepco (DC0000094)[3]	0
	Point Sources/WLAs	**0**
	Total Watts Branch	**0.001**
Fort Chaplin Run[4]	MS4	0
	Point Sources/WLAs	**0**
	Total Fort Chaplin Run	**0**
Fort Dupont Creek	Contaminated Sites	0
	Nonpoint Sources/LAs	**0**
	MS4	0
	Point Sources/WLAs	**0**
	Total Fort Dupont Creek	**0**
Fort Davis Tributary[4]	MS4	0
	Point Sources/WLAs	**0**
	Total Fort Davis Tributary	**0**

[1]DC delineates Watts Branch as two assessment units, but for the purposes of this TMDL, Watts Branch #1 and #2 were combined.
[2]Upstream loads from the MD portion of the watershed.
[3]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.
[4]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Informational Annual Load Tables for Unimpaired Segments

Table A-11 Informational Annual Loads for Unimpaired Segments for Arsenic

Segment	Source	Baseline Load (g/year)	Baseline Load (%)	TMDL (g/year)	Load Reduction (%)
Hickey Run[1]	MS4	2647.22	91.49	56.31	97.87
	MSGP	246.27	8.51	5.65	97.71
	Point Sources/WLAs	**2893.49**	**100**	**61.96**	**97.86**
	Total Hickey Run	**2893.49**	**100**	**61.96**	**97.86**
Watts Branch[2]	MD Upstream Load[3]	2591.50	35.20	95.55	96.31
	Contaminated Sites	1481.18	20.12	0.95	99.94

	Nonpoint Sources/LAs	**4072.68**	**55.32**	**96.50**	**97.63**
	MS4	3063.37	41.61	64.13	97.91
	Pepco (DC0000094)[4]	225.67	3.07	0.38	99.83
	Point Sources/WLAs	**3289.04**	**44.68**	**64.52**	**98.04**
	Total Watts Branch	**7361.72**	**100**	**161.01**	**97.81**
Popes Branch[1]	MS4	622.62	100	15.87	97.45
	Point Sources/WLAs	**622.62**	**100**	**15.87**	**97.45**
	Total Popes Branch	**622.62**	**100**	**15.87**	**97.45**

[1]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
[2]The District delineates Watts Branch as two assessment units, but for the purposes of this TMDL, Watts Branch #1 and #2 were combined.
[3]Upstream loads from the Maryland portion of the Watts Branch watershed.
[4]The loads for this individual discharger include both the land-based load attributed to the contaminated site and the load attributed to its discharge.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table A-12 Informational Annual Loads for Unimpaired Segments for Copper

Segment	Source	Baseline Load (g/year)	Baseline Load (%)	TMDL (g/year)	Load Reduction (%)
Nash Run	MD Upstream Load[1]	4238.37	23.38	4238.37	0
	Contaminated Sites	5311.76	29.30	157.31	97.04
	Nonpoint Sources/LAs	**9550.13**	**52.67**	**4395.68**	**53.97**
	MS4	8580.47	47.33	8580.47	0
	Point Sources/WLAs	**8580.47**	**47.33**	**8580.47**	**0**
	Total Nash Run	**18130.60**	**100**	**12976.15**	**28.43**
Hickey Run[2]	MS4	21680.40	90.40	21680.40	0
	MSGP	2301.90	9.60	2301.90	0
	Point Sources/WLAs	**23982.30**	**100**	**23982.30**	**0**
	Total Hickey Run	**23982.30**	**100**	**23982.30**	**0**
Watts Branch[3]	MD Upstream Load[1]	19959.86	38.04	19959.86	0
	Contaminated Sites	6762.41	12.89	202.87	97.00
	Nonpoint Sources/LAs	**26722.26**	**50.92**	**20162.73**	**24.55**
	MS4	23661.01	45.09	23661.01	0
	Pepco (DC0000094)[4]	2092.12	3.99	62.76	97.00
	Point Sources/WLAs	**25753.13**	**49.08**	**23723.77**	**7.88**
	Total Watts Branch	**52475.39**	**100**	**43886.50**	**16.37**
Kingman Lake[2]	MS4	9083.76	100	8745.12	3.73
	Point Sources/WLAs	**9083.76**	**100**	**8745.12**	**3.73**
	Total Kingman Lake	**9083.76**	**100**	**8745.12**	**3.73**
Fort Chaplin Run[2]	MS4	5240.77	100	5240.77	0
	Point Sources/WLAs	**5240.77**	**100**	**5240.77**	**0**

	Total Fort Chaplin Run	**5240.77**	**100**	**5240.77**	**0**
Fort Dupont Creek	Contaminated Sites	1379.82	21.38	55.19	96.00
	Nonpoint Sources/LAs	**1379.82**	**21.38**	**55.19**	**96.00**
	MS4	5075.35	78.62	5075.35	0
	Point Sources/WLAs	**5075.35**	**78.62**	**5075.35**	**0**
	Total Fort Dupont Creek	**6455.17**	**100**	**5130.54**	**20.52**
Popes Branch[2]	MS4	4529.63	100	4529.63	0
	Point Sources/WLAs	**4529.63**	**100**	**4529.63**	**0**
	Total Popes Branch	**4529.63**	**100**	**4529.63**	**0**
Fort Davis Tributary[2]	MS4	3943.71	100	3943.71	0
	Point Sources/WLAs	**3943.71**	**100**	**3943.71**	**0**
	Total Fort Davis Tributary	**3943.71**	**100**	**3943.71**	**0**
Texas Avenue Tributary[2]	MS4	4351.93	100	4351.93	0
	Point Sources/WLAs	**4351.93**	**100**	**4351.93**	**0**
	Total Texas Avenue Tributary	**4351.93**	**100**	**4351.93**	**0**
Anacostia #2[5]	Upstream Loads				
	MD Upstream Load[6]	1637143.32	86.79	1637143.32	0
	DC Point Source				
	Super Concrete (DC0000175)[7]	5445.83	0.29	5445.83	0
	Cumulative Load from Tributaries	94911.26	5.03	79843.3	15.88
	Load from Kingman Lake	9083.76	0.48	8745.12	3.73
	Cumulative Upstream Load	**1741138.34**	**92.3**	**1725731.74**	**0.88**
	Anacostia #2 Direct Drainage				
	Contaminated Sites	16817.68	0.89	516.29	96.93
	Nonpoint Sources/LAs	**16817.68**	**0.89**	**516.29**	**96.93**
	Anacostia #2 Direct Drainage				
	MS4	110535.47	5.86	110042.7	0.45
	MSGP	2405.23	0.13	2405.23	0
	Pepco (DC0000094)[4]	15510.94	0.82	595.19	96.16
	Point Sources/WLAs	**128451.64**	**6.81**	**113043.13**	**12**
	Total Anacostia #2	**1886407.67**	**100**	**1839291.15**	**2.5**
Fort Stanton Tributary[2]	MS4	6302.04	100	6302.04	0
	Point Sources/WLAs	**6302.04**	**100**	**6302.04**	**0**
	Total Fort Stanton Tributary	**6302.04**	**100**	**6302.04**	**0**
Anacostia #1[8]	Upstream Loads				
	Cumulative Load from Anacostia #2	1886407.67	90.76	1839291.15	2.5
	Cumulative Load from Tributaries	6302.04	0.3	6302.04	0
	Cumulative Upstream Load	**1892709.7**	**91.06**	**1845593.19**	**2.49**
	Anacostia #1 Direct Drainage				
	Contaminated Sites	53838.23	2.59	2174.56	95.96
	Nonpoint Sources/LAs	**53838.23**	**2.59**	**2174.56**	**95.96**

	Anacostia #1 Direct Drainage				
	CSS	35424.57	1.7	35424.57	0
	MS4	65658.72	3.16	65534.84	0.19
	MSGP	2293.44	0.11	2293.38	0
	DC Water Outfall 019 (DC0021199)	15306.35	0.74	15306.35	0
	Washington Navy Yard (DC0000141)[4]	13326.39	0.64	899.1	93.25
	Point Sources/WLAs	**132009.48**	**6.35**	**119458.25**	**9.51**
	Total Anacostia #1	**2078557.42**	**100**	**1967226**	**5.36**

[1]Upstream loads from the MD portion of the watershed.
[2]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
[3]DC delineates Watts Branch as two assessment units, but for the purposes of this TMDL, Watts Branch #1 and #2 were combined.
[4]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.
[5]Loads presented for the Anacostia #2 segment are cumulative. The loads for Anacostia #2 include loads from MD Anacostia Tidal Segment, Kingman Lake, tributaries to Anacostia #2, and direct drainage.
[6]Upstream loads from MD include loads from the MD Anacostia Tidal Segment watershed comprising the Northeast Branch, Northwest Branch, and direct drainage to the MD Anacostia Tidal Segment, as well as upstream loads from the MD portion of the Lower Beaverdam Creek, Watts Branch, and Nash Run which drain directly to DC waters.
[7]The WLA for Super Concrete (DC0000175), a DC NPDES point source, is presented as a component of the MD Upstream Load because its discharge enters an unnamed tributary in DC which then flows eastward across the DC/MD boundary and ultimately drains into the MD Northwest Branch. This WLA was inadvertently omitted from the allocation tables in earlier drafts of the TMDL Report but was reflected in the cumulative loads entering the Anacostia River mainstem in DC and individually in the TMDL allocation spreadsheets found in the Supporting Documents. The methodology to calculate the WLA for Super Concrete was described in earlier drafts of the TMDL Report and remains the same.
[8]Loads presented for the Anacostia #1 segment are cumulative. The loads for Anacostia #1 include cumulative loads from Anacostia #2, tributaries to Anacostia #1, and direct drainage.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table A-13 Informational Annual Loads for Unimpaired Segments for Zinc

Segment	Source	Baseline Load (g/year)	Baseline Load (%)	TMDL (g/year)	Load Reduction (%)
Nash Run	MD Upstream Load[1]	6732.03	28.72	6732.03	0
	Contaminated Sites	4012.47	17.12	876.82	78.15
	Nonpoint Sources/LAs	**10744.49**	**45.84**	**7608.85**	**29.18**
	MS4	12696.59	54.16	12696.59	0
	Point Sources/WLAs	**12696.59**	**54.16**	**12696.59**	**0**
	Total Nash Run	**23441.09**	**100**	**20305.44**	**13.38**
Hickey Run[2]	MS4	33824.98	89.56	33824.98	0
	MSGP	3941.20	10.44	3941.20	0
	Point Sources/WLAs	**37766.17**	**100**	**37766.17**	**0**
	Total Hickey Run	**37766.17**	**100**	**37766.17**	**0**
Watts Branch[3]	MD Upstream Load[1]	31505.52	42.02	31505.52	0
	Contaminated Sites	5033.68	6.71	998.72	80.16

	Nonpoint Sources/LAs	**36539.20**	**48.73**	**32504.24**	**11.04**
	MS4	36440.34	48.60	36440.34	0
	Pepco (DC0000094)[4]	2003.65	2.67	1602.92	20
	Point Sources/WLAs	**38443.99**	**51.27**	**38043.26**	**1.04**
	Total Watts Branch	**74983.20**	**100**	**70547.50**	**5.92**
Kingman Lake[2]	MS4	12530.61	100	12530.61	0
	Point Sources/WLAs	**12530.61**	**100**	**12530.61**	**0**
	Total Kingman Lake	**12530.61**	**100**	**12530.61**	**0**
Fort Chaplin Run[2]	MS4	7974.86	100	7974.86	0
	Point Sources/WLAs	**7974.86**	**100**	**7974.86**	**0**
	Total Fort Chaplin Run	**7974.86**	**100**	**7974.86**	**0**
Fort Dupont Creek	Contaminated Sites	1255.86	16.51	740.96	41
	Nonpoint Sources/LAs	**1255.86**	**16.51**	**740.96**	**41.00**
	MS4	6351.38	83.49	6351.38	0
	Point Sources/WLAs	**6351.38**	**83.49**	**6351.38**	**0**
	Total Fort Dupont Creek	**7607.24**	**100**	**7092.34**	**6.77**
Popes Branch[2]	MS4	6632.15	100	6632.15	0
	Point Sources/WLAs	**6632.15**	**100**	**6632.15**	**0**
	Total Popes Branch	**6632.15**	**100**	**6632.15**	**0**
Fort Davis Tributary[2]	MS4	6059.05	100	6059.05	0
	Point Sources/WLAs	**6059.05**	**100**	**6059.05**	**0**
	Total Fort Davis Tributary	**6059.05**	**100**	**6059.05**	**0**
Texas Avenue Tributary[2]	MS4	6666.34	100	6666.34	0
	Point Sources/WLAs	**6666.34**	**100**	**6666.34**	**0**
	Total Texas Avenue Tributary	**6666.34**	**100**	**6666.34**	**0**
Anacostia #2[5]	Upstream Loads				
	MD Upstream Load[6]	2.55E+06	88.01	2.55E+06	0
	DC Point Source				
	Super Concrete (DC0000175)[7]	7.12E+04	2.45	7.12E+04	0
	Cumulative Load from Tributaries	1.33E+05	4.58	1.25E+05	6.08
	Load from Kingman Lake	1.25E+04	0.43	1.25E+04	0
	Cumulative Upstream Load	**2.70E+06**	**93.02**	**2.69E+06**	**0.3**
	Anacostia #2 Direct Drainage				
	Contaminated Sites	12927.84	0.45	3394.98	73.74
	Nonpoint Sources/LAs	**12927.84**	**0.45**	**3394.98**	**73.74**
	Anacostia #2 Direct Drainage				
	MS4	1.68E+05	5.78	1.68E+05	0
	MSGP	4.12E+03	0.14	4.12E+03	0
	Pepco (DC0000094)[4]	1.77E+04	0.61	1.36E+04	23.1
	Point Sources/WLAs	**1.90E+05**	**6.54**	**1.86E+05**	**2.15**
	Total Anacostia #2	**2.90E+06**	**100**	**2.88E+06**	**0.75**

Fort Stanton Tributary[2]	MS4	9627.02	100	9627.02	0
	Point Sources/WLAs	**9627.02**	**100**	**9627.02**	**0**
	Total Fort Stanton Tributary	**9627.02**	**100**	**9627.02**	**0**
Anacostia #1[8]	Upstream Loads				
	Cumulative Load from Anacostia #2	2.90E+06	86.85	2.88E+06	0.75
	Cumulative Load from Tributaries	9.63E+03	0.29	9.63E+03	0
	Cumulative Upstream Load	**2.91E+06**	**87.14**	**2.89E+06**	**0.75**
	Anacostia #1 Direct Drainage				
	Contaminated Sites	5.03E+04	1.51	2.18E+04	56.64
	Nonpoint Sources/LAs	**5.03E+04**	**1.51**	**2.18E+04**	**56.64**
	Anacostia #1 Direct Drainage				
	CSS	5.70E+04	1.71	5.70E+04	0
	MS4	1.04E+05	3.1	1.04E+05	0
	MSGP	4.00E+03	0.12	4.00E+03	0
	DC Water Outfall 019 (DC0021199)	2.00E+05	5.99	2.00E+05	0
	Washington Navy Yard (DC0000141)[4]	1.48E+04	0.44	1.00E+04	32.22
	Point Sources/WLAs	**3.80E+05**	**11.36**	**3.75E+05**	**1.26**
	Total Anacostia #1	**3.34E+06**	**100**	**3.29E+06**	**1.64**

[1]Upstream loads from the MD portion of the watershed.
[2]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
[3]DC delineates Watts Branch as two assessment units, but for the purposes of this TMDL, Watts Branch #1 and #2 were combined.
[4]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.
[5]Loads presented for the Anacostia #2 segment are cumulative. The loads for Anacostia #2 include loads from MD Anacostia Tidal Segment, Kingman Lake, tributaries to Anacostia #2, and direct drainage.
[6]Upstream loads from MD include loads from the MD Anacostia Tidal Segment watershed comprising the Northeast Branch, Northwest Branch, and direct drainage to the MD Anacostia Tidal Segment, as well as upstream loads from the MD portion of the Lower Beaverdam Creek, Watts Branch, and Nash Run which drain directly to DC waters.
[7]The WLA for Super Concrete (DC0000175), a DC NPDES point source, is presented as a component of the MD Upstream Load because its discharge enters an unnamed tributary in DC which then flows eastward across the DC/MD boundary and ultimately drains into the MD Northwest Branch. This WLA was inadvertently omitted from the allocation tables in earlier drafts of the TMDL Report but was reflected in the cumulative loads entering the Anacostia River mainstem in DC and individually in the TMDL allocation spreadsheets found in the Supporting Documents. The methodology to calculate the WLA for Super Concrete was described in earlier drafts of the TMDL Report and remains the same.
[8]Loads presented for the Anacostia #1 segment are cumulative. The loads for Anacostia #1 include cumulative loads from Anacostia #2, tributaries to Anacostia #1, and direct drainage.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table A-14 Informational Annual Loads for Unimpaired Segments for Chlordane

Segment	Source	Baseline Load (g/year)	Baseline Load (%)	TMDL (g/year)	Load Reduction (%)
Nash Run	MD Upstream Load[1]	4.278	29.69	0.049	98.86
	Contaminated Sites	1.864	12.94	0.007	99.62

	Nonpoint Sources/LAs	**6.142**	**42.63**	**0.056**	**99.09**
	MS4	8.267	57.37	0.119	98.56
	Point Sources/WLAs	**8.267**	**57.37**	**0.119**	**98.56**
	Total Nash Run	**14.409**	**100**	**0.175**	**98.79**
Hickey Run[2]	MS4	21.502	90.41	0.276	98.71
	MSGP	2.281	9.59	0.026	98.86
	Point Sources/WLAs	**23.783**	**100**	**0.302**	**98.73**
	Total Hickey Run	**23.783**	**100**	**0.302**	**98.73**
Watts Branch[3]	MD Upstream Load[1]	20.164	42.85	0.329	98.37
	Contaminated Sites	2.179	4.63	0.008	99.62
	Nonpoint Sources/LAs	**22.343**	**47.48**	**0.337**	**98.49**
	MS4	23.442	49.82	0.339	98.55
	Pepco (DC0000094)[4]	1.273	2.70	0.005	99.62
	Point Sources/WLAs	**24.715**	**52.52**	**0.344**	**98.61**
	Total Watts Branch	**47.058**	**100**	**0.681**	**98.55**
Fort Chaplin Run[2]	MS4	5.329	100	0.073	98.63
	Point Sources/WLAs	**5.329**	**100**	**0.073**	**98.63**
	Total Fort Chaplin Run	**5.329**	**100**	**0.073**	**98.63**
Fort Dupont Creek	Contaminated Sites	0.758	13.02	0.003	99.62
	Nonpoint Sources/LAs	**0.758**	**13.02**	**0.003**	**99.62**
	MS4	5.066	86.98	0.077	98.49
	Point Sources/WLAs	**5.066**	**86.98**	**0.077**	**98.49**
	Total Fort Dupont Creek	**5.825**	**100**	**0.080**	**98.63**
Fort Davis Tributary[2]	MS4	4.094	100	0.053	98.72
	Point Sources/WLAs	**4.094**	**100**	**0.053**	**98.72**
	Total Fort Davis Tributary	**4.094**	**100**	**0.053**	**98.72**
Anacostia #2[5]	Upstream Loads				
	MD Upstream Load[6]	1542.016	87.44	26.907	98.26
	DC Point Source				
	Super Concrete (DC0000175)[7]	0.195	0.01	0.195	0
	Cumulative Load from Tributaries	85.078	4.82	1.095	98.71
	Load from Kingman Lake	8.64	0.49	0.108	98.75
	Cumulative Upstream Load	**1635.734**	**92.76**	**28.110**	**98.28**
	Anacostia #2 Direct Drainage				
	Contaminated Sites	6.031	0.34	0.023	99.62
	Nonpoint Sources/LAs	**6.031**	**0.34**	**0.023**	**99.62**
	Anacostia #2 Direct Drainage				
	MS4	109.994	6.24	1.452	98.68
	MSGP	2.397	0.14	0.027	98.87
	Pepco (DC0000094)[4]	9.301	0.53	0.041	99.56
	Point Sources/WLAs	**121.692**	**6.9**	**1.52**	**98.75**

	Total Anacostia #2	**1763.457**	**100**	**29.652**	**98.32**
Fort Stanton Tributary[2]	MS4	6.138	100	0.081	98.67
	Point Sources/WLAs	**6.138**	**100**	**0.081**	**98.67**
	Total Fort Stanton Tributary	**6.138**	**100**	**0.081**	**98.67**

[1]Upstream loads from the MD portion of the watershed.
[2]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
[3]DC delineates Watts Branch as two assessment units, but for the purposes of this TMDL, Watts Branch #1 and #2 were combined.
[4]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.
[5]Loads presented for the Anacostia #2 segment are cumulative. The loads for Anacostia #2 include loads from MD Anacostia Tidal Segment, Kingman Lake, tributaries to Anacostia #2, and direct drainage.
[6]Upstream loads from MD include loads from the MD Anacostia Tidal Segment watershed comprising the Northeast Branch, Northwest Branch, and direct drainage to the MD Anacostia Tidal Segment, as well as upstream loads from the MD portion of the Lower Beaverdam Creek, Watts Branch, and Nash Run which drain directly to DC waters.
[7]The WLA for Super Concrete (DC0000175), a DC NPDES point source, is presented as a component of the MD Upstream Load because its discharge enters an unnamed tributary in DC which then flows eastward across the DC/MD boundary and ultimately drains into the MD Northwest Branch. This WLA was inadvertently omitted from the allocation tables in earlier drafts of the TMDL Report but was reflected in the cumulative loads entering the Anacostia River mainstem in DC and individually in the TMDL allocation spreadsheets found in the Supporting Documents. The methodology to calculate the WLA for Super Concrete was described in earlier drafts of the TMDL Report and remains the same.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table A-15 Informational Annual Loads for Unimpaired Segments for DDT and its Metabolites

Segment	**Source**	**Baseline Load (g/year)**	**Baseline Load (%)**	**TMDL (g/year)**	**Load Reduction (%)**
Nash Run	MD Upstream Load[1]	0.2944	12.45	0.0022	99.25
	Contaminated Sites	1.4498	61.32	0.0036	99.75
	Nonpoint Sources/LAs	**1.7442**	**73.77**	**0.0058**	**99.67**
	MS4	0.6201	26.23	0.0065	98.95
	Point Sources/WLAs	**0.6201**	**26.23**	**0.0065**	**98.95**
	Total Nash Run	**2.3643**	**100**	**0.0123**	**99.48**
Watts Branch[2]	MD Upstream Load[1]	1.4619	28.02	0.0158	98.92
	Contaminated Sites	1.8287	35.05	0.0045	99.75
	Nonpoint Sources/LAs	**3.2906**	**63.07**	**0.0203**	**99.38**
	MS4	1.6704	32.01	0.0157	99.06
	Pepco (DC0000094)[3]	0.2566	4.92	0.0006	99.77
	Point Sources/WLAs	**1.927**	**36.93**	**0.0163**	**99.15**
	Total Watts Branch	**5.2176**	**100**	**0.0366**	**99.30**
Fort Chaplin Run[4]	MS4	0.399	100	0.0036	99.10
	Point Sources/WLAs	**0.399**	**100**	**0.0036**	**99.10**
	Total Fort Chaplin Run	**0.399**	**100**	**0.0036**	**99.10**
Fort Dupont Creek	Contaminated Sites	0.2193	30.29	0.0005	99.77

	Nonpoint Sources/LAs	**0.2193**	**30.29**	**0.0005**	**99.77**
	MS4	0.5047	69.71	0.0050	99.01
	Point Sources/WLAs	**0.5047**	**69.71**	**0.0050**	**99.01**
	Total Fort Dupont Creek	**0.724**	**100**	**0.0055**	**99.24**
Fort Davis Tributary[4]	MS4	0.3075	100	0.0026	99.15
	Point Sources/WLAs	**0.3075**	**100**	**0.0026**	**99.15**
	Total Fort Davis Tributary	**0.3075**	**100**	**0.0026**	**99.15**
Fort Stanton Tributary[4]	MS4	0.4449	100	0.0038	99.15
	Point Sources/WLAs	**0.4449**	**100**	**0.0038**	**99.15**
	Total Fort Stanton Tributary	**0.4449**	**100**	**0.0038**	**99.15**

[1]Upstream loads from the MD portion of the watershed.
[2]DC delineates Watts Branch as two assessment units, but for the purposes of this TMDL, Watts Branch #1 and #2 were combined.
[3]The loads for this individual discharger include both the landbased load attributed to the contaminated land and the load attributed to its discharge.
[4]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table A-16 Informational Annual Loads for Unimpaired Segments for Dieldrin

Segment	**Source**	**Baseline Load (g/year)**	**Baseline Load (%)**	**TMDL (g/year)**	**Load Reduction (%)**
Hickey Run[1]	MS4	4.1655	88.84	0	100
	MSGP	0.5231	11.16	0	100
	Point Sources/WLAs	**4.6886**	**100**	**0**	**100**
	Total Hickey Run	**4.6886**	**100**	**0**	**100**
Fort Chaplin Run[1]	MS4	0.9656	100	0	100
	Point Sources/WLAs	**0.9656**	**100**	**0**	**100**
	Total Fort Chaplin Run	**0.9656**	**100**	**0**	**100**
Fort Dupont Creek	Contaminated Sites	0.4201	40.61	0	100
	Nonpoint Sources/LAs	**0.4201**	**40.61**	**0**	**100**
	MS4	0.6144	59.39	0	100
	Point Sources/WLAs	**0.6144**	**59.39**	**0**	**100**
	Total Fort Dupont Creek	**1.0345**	**100**	**0**	**100**
Fort Davis Tributary[1]	MS4	0.7282	100	0	100
	Point Sources/WLAs	**0.7282**	**100**	**0**	**100**
	Total Fort Davis Tributary	**0.7282**	**100**	**0**	**100**
Fort Stanton Tributary[1]	MS4	1.2066	100	0	100
	Point Sources/WLAs	**1.2066**	**100**	**0**	**100**
	Total Fort Stanton Tributary	**1.2066**	**100**	**0**	**100**

[1]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
Note 1: The MOS is implicit.

Note 2: Columns may not precisely add to totals due to rounding.

Table A-17 Informational Annual Loads for Unimpaired Segments for Heptachlor Epoxide

Segment	Source	Baseline Load (g/year)	Baseline Load (%)	TMDL (g/year)	Load Reduction (%)
Hickey Run[1]	MS4	3.4984	90.93	0.0327	99.07
	MSGP	0.3491	9.07	0.0033	99.05
	Point Sources/WLAs	**3.8475**	**100**	**0.0360**	**99.06**
	Total Hickey Run	**3.8475**	**100**	**0.0360**	**99.06**
Watts Branch[2]	MD Upstream Load[3]	3.3330	34.12	0.0371	98.89
	Contaminated Sites	2.2233	22.76	0.0009	99.96
	Nonpoint Sources/LAs	**5.5563**	**56.88**	**0.0380**	**99.32**
	MS4	3.9569	40.51	0.0381	99.04
	Pepco (DC0000094)[4]	0.2554	2.61	0.0004	99.84
	Point Sources/WLAs	**4.2123**	**43.12**	**0.0385**	**99.09**
	Total Watts Branch	**9.7686**	**100**	**0.0765**	**99.22**
Kingman Lake[1]	MS4	1.5733	100	0.0132	99.16
	Point Sources/WLAs	**1.5733**	**100**	**0.0132**	**99.16**
	Total Kingman Lake	**1.5733**	**100**	**0.0132**	**99.16**
Fort Chaplin Run[1]	MS4	0.8972	100	0.0089	99.01
	Point Sources/WLAs	**0.8972**	**100**	**0.0089**	**99.01**
	Total Fort Chaplin Run	**0.8972**	**100**	**0.0089**	**99.01**
Fort Dupont Creek	Contaminated Sites	0.2366	20.29	0.0003	99.87
	Nonpoint Sources/LAs	**0.2366**	**20.29**	**0.0003**	**99.87**
	MS4	0.9296	79.71	0.0083	99.11
	Point Sources/WLAs	**0.9296**	**79.71**	**0.0083**	**99.11**
	Total Fort Dupont Creek	**1.1662**	**100**	**0.0086**	**99.26**
Fort Davis Tributary[1]	MS4	0.6827	100	0.0071	98.96
	Point Sources/WLAs	**0.6827**	**100**	**0.0071**	**98.96**
	Total Fort Davis Tributary	**0.6827**	**100**	**0.0071**	**98.96**
Fort Stanton Tributary[1]	MS4	1.0621	100	0.0097	99.09
	Point Sources/WLAs	**1.0621**	**100**	**0.0097**	**99.09**
	Total Fort Stanton Tributary	**1.0621**	**100**	**0.0097**	**99.09**

[1]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
[2]DC delineates Watts Branch as two assessment units, but for the purposes of this TMDL, Watts Branch #1 and #2 were combined.
[3]Upstream loads from the MD portion of the watershed.
[4]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table A-18 Informational Annual Loads for Unimpaired Segments for the PAH 1 Group

Segment	Source	Baseline Load (g/year)	Baseline Load (%)	TMDL (g/year)	Load Reduction (%)
Nash Run	MD Upstream Load[1]	56.34	28.56	56.34	0
	Contaminated Sites	36.42	18.46	36.42	0
	Nonpoint Sources/LAs	**92.76**	**47.01**	**92.76**	**0**
	MS4	104.55	52.99	104.55	0
	Point Sources/WLAs	**104.55**	**52.99**	**104.55**	**0**
	Total Nash Run	**197.31**	**100**	**197.31**	**0**
Hickey Run[2]	MS4	283.93	89.33	283.93	0
	MSGP	33.93	10.67	33.93	0
	Point Sources/WLAs	**317.85**	**100**	**317.85**	**0**
	Total Hickey Run	**317.85**	**100**	**317.85**	**0**
Watts Branch[3]	MD Upstream Load[1]	254.23	40.52	254.23	0
	Contaminated Sites	42.71	6.81	42.71	0
	Nonpoint Sources/LAs	**296.94**	**47.33**	**296.94**	**0**
	MS4	303.58	48.39	303.58	0
	Pepco (DC0000094)[4]	26.85	4.28	26.85	0
	Point Sources/WLAs	**330.43**	**52.67**	**330.43**	**0**
	Total Watts Branch	**627.37**	**100**	**627.37**	**0**
Kingman Lake[2]	MS4	100.12	100	100.12	0
	Point Sources/WLAs	**100.12**	**100**	**100.12**	**0**
	Total Kingman Lake	**100.12**	**100**	**100.12**	**0**
Fort Chaplin Run[4]	MS4	66.25	100	66.25	0
	Point Sources/WLAs	**66.25**	**100**	**66.25**	**0**
	Total Fort Chaplin Run	**66.25**	**100**	**66.25**	**0**
Fort Dupont Creek	Contaminated Sites	15.81	24.24	15.81	0
	Nonpoint Sources/LAs	**15.81**	**24.24**	**15.81**	**0**
	MS4	49.39	75.76	49.39	0
	Point Sources/WLAs	**49.39**	**75.76**	**49.39**	**0**
	Total Fort Dupont Creek	**65.20**	**100**	**65.20**	**0**
Popes Branch[2]	MS4	54.44	100	54.44	0
	Point Sources/WLAs	**54.44**	**100**	**54.44**	**0**
	Total Popes Branch	**54.44**	**100**	**54.44**	**0**
Fort Davis Tributary[4]	MS4	50.45	100	50.45	0
	Point Sources/WLAs	**50.45**	**100**	**50.45**	**0**
	Total Fort Davis Tributary	**50.45**	**100**	**50.45**	**0**
Texas Avenue Tributary[2]	MS4	55.55	100	55.55	0
	Point Sources/WLAs	**55.55**	**100**	**55.55**	**0**
	Total Texas Avenue Tributary	**55.55**	**100**	**55.55**	**0**

Anacostia #2[5]	Upstream Loads				
	MD Upstream Load[6]	19529.87	86.8	49880.05	0*
	DC Point Source				
	Super Concrete (DC0000175)[7]	39.51	0.18	30389.69	0*
	Cumulative Load from Tributaries	1123.85	4.99	1123.85	0
	Load from Kingman Lake	100.12	0.44	100.12	0
	Cumulative Upstream Load	**20753.84**	**92.24**	**51104.02**	**0***
	Anacostia #2 Direct Drainage				
	Contaminated Sites	119.56	0.53	119.56	0
	Nonpoint Sources/LAs	**119.56**	**0.53**	**119.56**	**0**
	Anacostia #2 Direct Drainage				
	MS4	1394.02	6.2	1394.02	0
	MSGP	35.5	0.16	35.5	0
	Pepco (DC0000094)[4]	197.34	0.88	1023.19	0*
	Point Sources/WLAs	**1626.86**	**7.23**	**2452.71**	**0***
	Total Anacostia #2	**22500.26**	**100**	**53676.3**	**0***
Fort Stanton Tributary[2]	MS4	79.42	100	79.42	0
	Point Sources/WLAs	**79.42**	**100**	**79.42**	**0**
	Total Fort Stanton Tributary	**79.42**	**100**	**79.42**	**0**
Anacostia #1[8]	Upstream Loads				
	Cumulative Load from Anacostia #2	22500.26	91.09	53676.3	0*
	Cumulative Load from Tributaries	79.42	0.32	79.4213	0
	Cumulative Upstream Load	**22579.69**	**91.41**	**53755.72**	**0***
	Anacostia #1 Direct Drainage				
	Contaminated Sites	467.52	1.89	467.52	0
	Nonpoint Sources/LAs	**467.52**	**1.89**	**467.52**	**0**
	Anacostia #1 Direct Drainage				
	CSS	481.59	1.95	481.59	0
	MS4	867.25	3.51	867.25	0
	MSGP	35.5	0.14	35.5	0
	DC Water Outfall 019 (DC0021199)	111.04	0.45	85414.92	0*
	Washington Navy Yard (DC0000141)[4]	159.72	0.65	159.72	0
	Point Sources/WLAs	**1655.09**	**6.7**	**86958.97**	**0***
	Total Anacostia #1	**24702.3**	**100**	**141182.21**	**0***

[1]Upstream loads from the MD portion of the watershed.
[2]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
[3]DC delineates Watts Branch as two assessment units, but for the purposes of this TMDL, Watts Branch #1 and #2 were combined.
[4]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.
[5]Loads presented for the Anacostia #2 segment are cumulative. The loads for Anacostia #2 include loads from MD Anacostia Tidal Segment, Kingman Lake, tributaries to Anacostia #2, and direct drainage.

[6]Upstream loads from MD include loads from the MD Anacostia Tidal Segment watershed comprising the Northeast Branch, Northwest Branch, and direct drainage to the MD Anacostia Tidal Segment, as well as upstream loads from the MD portion of the Lower Beaverdam Creek, Watts Branch, and Nash Run which drain directly to DC waters.
[7]The WLA for Super Concrete (DC0000175), a DC NPDES point source, is presented as a component of the MD Upstream Load because its discharge enters an unnamed tributary in DC which then flows eastward across the DC/MD boundary and ultimately drains into the MD Northwest Branch. This WLA was inadvertently omitted from the allocation tables in earlier drafts of the TMDL Report but was reflected in the cumulative loads entering the Anacostia River mainstem in DC and individually in the TMDL allocation spreadsheets found in the Supporting Documents. The methodology to calculate the WLA for Super Concrete was described in earlier drafts of the TMDL Report and remains the same.
[8]Loads presented for the Anacostia #1 segment are cumulative. The loads for Anacostia #1 include cumulative loads from Anacostia #2, tributaries to Anacostia #1, and direct drainage.
*Due to the endpoint selected to represent the PAH 1 group, in some cases a negative percent reduction is called for but are presented as zero because the PAHs in the PAH 1 group do not need to be reduced from those sources.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table A-19 Informational Annual Loads for Unimpaired Segments for the PAH 2 Group

Segment	Source	Baseline Load (g/year)	Baseline Load (%)	TMDL (g/year)	Load Reduction (%)
Watts Branch[1]	MD Upstream Load[2]	600.10	38.58	0.03	99.99
	Contaminated Sites	120.58	7.75	0	100
	Nonpoint Sources/LAs	**720.68**	**46.33**	**0.03**	**100**
	MS4	718.85	46.22	0	100
	Pepco (DC0000094)[3]	115.84	7.45	0	100
	Point Sources/WLAs	**834.69**	**53.67**	**0**	**100**
	Total Watts Branch	**1555.37**	**100**	**0.03**	**100**
Fort Chaplin Run[4]	MS4	156.20	100	0	100
	Point Sources/WLAs	**156.20**	**100**	**0**	**100**
	Total Fort Chaplin Run	**156.20**	**100**	**0**	**100**
Fort Dupont Creek	Contaminated Sites	64.38	36.34	0	100
	Nonpoint Sources/LAs	**64.38**	**36.34**	**0**	**100**
	MS4	112.78	63.66	0	100
	Point Sources/WLAs	**112.78**	**63.66**	**0**	**100**
	Total Fort Dupont Creek	**177.16**	**100**	**0**	**100**
Fort Davis Tributary[4]	MS4	118.85	100	0	100
	Point Sources/WLAs	**118.85**	**100**	**0**	**100**
	Total Fort Davis Tributary	**118.85**	**100**	**0**	**100**

[1]DC delineates Watts Branch as two assessment units, but for the purposes of this TMDL, Watts Branch #1 and #2 were combined.
[2]Upstream loads from the MD portion of the watershed.
[3]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.
[4]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Table A-20 Informational Annual Loads for Unimpaired Segments for the PAH 3 Group

Segment	Source	Baseline Load (g/year)	Baseline Load (%)	TMDL (g/year)	Load Reduction (%)
Watts Branch[1]	MD Upstream Load[2]	494.783	38.61	0.003	100
	Contaminated Sites	102.996	8.04	0	100
	Nonpoint Sources/LAs	**597.779**	**46.65**	**0.003**	**100**
	MS4	590.534	46.09	0	100
	Pepco (DC0000094)[3]	93.051	7.26	0	100
	Point Sources/WLAs	**683.585**	**53.35**	**0**	**100**
	Total Watts Branch	**1281.364**	**100**	**0.003**	**100**
Fort Chaplin Run[4]	MS4	128.931	100	0	100
	Point Sources/WLAs	**128.931**	**100**	**0**	**100**
	Total Fort Chaplin Run	**128.931**	**100**	**0**	**100**
Fort Dupont Creek	Contaminated Sites	52.087	35.21	0	100
	Nonpoint Sources/LAs	**52.087**	**35.21**	**0**	**100**
	MS4	95.849	64.79	0	100
	Point Sources/WLAs	**95.849**	**64.79**	**0**	**100**
	Total Fort Dupont Creek	**147.936**	**100**	**0**	**100**
Fort Davis Tributary[4]	MS4	98.234	100	0	100
	Point Sources/WLAs	**98.234**	**100**	**0**	**100**
	Total Fort Davis Tributary	**98.234**	**100**	**0**	**100**

[1]DC delineates Watts Branch as two assessment units, but for the purposes of this TMDL, Watts Branch #1 and #2 were combined.
[2]Upstream loads from the MD portion of the watershed.
[3]The loads for this individual discharger include both the landbased load attributed to the contaminated site and the load attributed to its discharge.
[4]No LA is presented for these segments because all stormwater runoff is captured by the MS4.
Note 1: The MOS is implicit.
Note 2: Columns may not precisely add to totals due to rounding.

Contaminated Site Informational LAs for Unimpaired Segments

Informational Daily LAs

Table A-211 Contaminated Site Informational Daily LAs for Unimpaired Segments for Copper

Segment	Contaminated Site	LA (g/day)
Nash Run	Kenilworth Park Landfill North	40.31
Watts Branch	Kenilworth Park Landfill North	41.83
Fort Dupont Creek	CSX	29.34
Anacostia #2	CSX	85.69
	Kenilworth Park Landfill North	399.5
	Kenilworth Park Landfill South	87.45

Anacostia #1	Firth Sterling Steel	17.31
	Former Hess Petroleum Terminal	922
	Former Steuart Petroleum	50.05
	Fort McNair	274.15
	JBAB AOC 1	20.31
	JBAB Site 1	53.85
	JBAB Site 2	1719.75
	JBAB Site 3	70.07
	Joint Base Anacostia-Bolling (JBAB)	6.1
	Poplar Point	1107.53
	Southeast Federal Center	749.9
	Washington Gas	562.35

Table A-22 Contaminated Site Informational Daily LAs for Unimpaired Segments for Zinc

Segment	Contaminated Site	LA (g/day)
Nash Run	Kenilworth Park Landfill North	169.18
Watts Branch	Kenilworth Park Landfill North	150.50
Fort Dupont Creek	CSX	256.53
Anacostia #2	CSX	570.23
	Kenilworth Park Landfill North	948.47
	Kenilworth Park Landfill South	198.16
Anacostia #1	Firth Sterling Steel	13.04
	Former Hess Petroleum Terminal	1839.54
	Former Steuart Petroleum	40.53
	Fort McNair	232.26
	JBAB AOC 1	25.33
	JBAB Site 1	82.03
	JBAB Site 2	2371.23
	JBAB Site 3	54.06
	Joint Base Anacostia-Bolling (JBAB)	11.88
	Poplar Point	966.95
	Southeast Federal Center	2177.94
	Washington Gas	504.85

Table A-22 Contaminated Site Informational Daily LAs for Unimpaired Segments for Chlordane

Segment	Contaminated Site	LA (g/day)
Nash Run	Kenilworth Park Landfill North	1.28E-03
Watts Branch	Kenilworth Park Landfill North	1.18E-03
Fort Dupont Creek	CSX	7.35E-04

Anacostia #2	CSX	5.70E-03
	Kenilworth Park Landfill North	1.98E-02
	Kenilworth Park Landfill South	4.02E-03

Table A-23 Contaminated Site Informational Daily LAs for Unimpaired Segments for DDT and its Metabolites

Segment	Contaminated Site	LA (g/day)
Nash Run	Kenilworth Park Landfill North	1.39E-03
Watts Branch	Kenilworth Park Landfill North	1.16E-03
Fort Dupont Creek	CSX	1.91E-04

Table A-24 Contaminated Site Informational Daily LAs for Unimpaired Segments for Dieldrin

Segment	Contaminated Site	LA (g/day)
Fort Dupont Creek	CSX	0

Table A-25 Contaminated Site Informational Daily LAs for Unimpaired Segments for Heptachlor Epoxide

Segment	Contaminated Site	LA (g/day)
Watts Branch	Kenilworth Park Landfill North	1.95E-04
Fort Dupont Creek	CSX	1.42E-04

Table A-26 Contaminated Site Informational Daily LAs for Unimpaired Segments for the PAH 1 Group

Segment	Contaminated Site	LA (g/day)
Nash Run	Kenilworth Park Landfill North	6.17
Watts Branch	Kenilworth Park Landfill North	5.67
Fort Dupont Creek	CSX	3.63
Anacostia #2	CSX	2.42
	Kenilworth Park Landfill North	7.94
	Kenilworth Park Landfill South	1.64
Anacostia #1	Firth Sterling Steel	0.07
	Former Hess Petroleum Terminal	4.62
	Former Steuart Petroleum	0.19
	Fort McNair	1.21
	JBAB AOC 1	0.09
	JBAB Site 1	0.21
	JBAB Site 2	6.81
	JBAB Site 3	0.29
	Joint Base Anacostia-Bolling (JBAB)	0.03
	Poplar Point	5.76

	Southeast Federal Center	5.86
	Washington Gas	2.05

Table A-27 Contaminated Site Informational Daily LAs for Unimpaired Segments for the PAH 2 Group

Segment	Contaminated Site	LA (g/day)
Watts Branch	Kenilworth Park Landfill North	0
Fort Dupont Creek	CSX	0

Table A-29 Contaminated Site Informational Daily LAs for Unimpaired Segments for the PAH 3 Group

Segment	Contaminated Site	LA (g/day)
Watts Branch	Kenilworth Park Landfill North	0
Fort Dupont Creek	CSX	0

Informational Annual LAs

Table A-28 Contaminated Site Informational Annual LAs for Unimpaired Segments for Copper

Segment	Contaminated Site	LA (g/year)
Nash Run	Kenilworth Park Landfill North	157.31
Watts Branch	Kenilworth Park Landfill North	202.87
Fort Dupont Creek	CSX	55.19
Anacostia #2	CSX	77.26
	Kenilworth Park Landfill North	360.1836
	Kenilworth Park Landfill South	78.85
Anacostia #1	Firth Sterling Steel	6.78
	Former Hess Petroleum Terminal	361.03
	Former Steuart Petroleum	19.6
	Fort McNair	107.35
	JBAB AOC 1	7.95
	JBAB Site 1	21.09
	JBAB Site 2	673.41
	JBAB Site 3	27.44
	Joint Base Anacostia-Bolling (JBAB)	2.39
	Poplar Point	433.68
	Southeast Federal Center	293.64
	Washington Gas	220.2

Table A-29 Contaminated Site Informational Annual LAs for Unimpaired Segments for Zinc

Segment	Contaminated Site	LA (g/year)
Nash Run	Kenilworth Park Landfill North	876.82
Watts Branch	Kenilworth Park Landfill North	998.72
Fort Dupont Creek	CSX	740.96
Anacostia #2	CSX	1127.603
	Kenilworth Park Landfill North	1875.541
	Kenilworth Park Landfill South	391.8396
Anacostia #1	Firth Sterling Steel	34.19
	Former Hess Petroleum Terminal	4821.88
	Former Steuart Petroleum	106.23
	Fort McNair	608.82
	JBAB AOC 1	66.40
	JBAB Site 1	215.03
	JBAB Site 2	6215.57
	JBAB Site 3	141.70
	Joint Base Anacostia-Bolling (JBAB)	31.15
	Poplar Point	2534.62
	Southeast Federal Center	5708.90
	Washington Gas	1323.34

Table A-30 Contaminated Site Informational Annual LAs for Unimpaired Segments for Chlordane

Segment	Contaminated Site	LA (g/year)
Nash Run	Kenilworth Park Landfill North	7.10E-03
Watts Branch	Kenilworth Park Landfill North	8.20E-03
Fort Dupont Creek	CSX	0.003
Anacostia #2	CSX	4.40E-03
	Kenilworth Park Landfill North	1.53E-02
	Kenilworth Park Landfill South	3.10E-03

Table A-31 Contaminated Site Informational Annual LAs for Unimpaired Segments for DDT and its Metabolites

Segment	Contaminated Site	LA (g/year)
Nash Run	Kenilworth Park Landfill North	0.004
Watts Branch	Kenilworth Park Landfill North	0.005
Fort Dupont Creek	CSX	0.001

Table A-32 Contaminated Site Informational Annual LAs for Unimpaired Segments for Dieldrin

Segment	Contaminated Site	LA (g/year)
Fort Dupont Creek	CSX	0

Table A-33 Contaminated Site Informational Annual LAs for Unimpaired Segments for Heptachlor Epoxide

Segment	Contaminated Site	LA (g/year)
Watts Branch	Kenilworth Park Landfill North	9.00E-04
Fort Dupont Creek	CSX	3.00E-04

Table A-34 Contaminated Site Annual LAs for Unimpaired Segments for the PAH 1 Group

Segment	Contaminated Site	LA (g/year)
Nash Run	Kenilworth Park Landfill North	36.42
Watts Branch	Kenilworth Park Landfill North	42.71
Fort Dupont Creek	CSX	15.81
Anacostia #2	CSX	24.13
	Kenilworth Park Landfill North	79.13
	Kenilworth Park Landfill South	16.31
Anacostia #1	Firth Sterling Steel	1.20
	Former Hess Petroleum Terminal	79.49
	Former Steuart Petroleum	3.29
	Fort McNair	20.82
	JBAB AOC 1	1.55
	JBAB Site 1	3.55
	JBAB Site 2	117.07
	JBAB Site 3	5.01
	Joint Base Anacostia-Bolling (JBAB)	0.48
	Poplar Point	98.97
	Southeast Federal Center	100.77
	Washington Gas	35.32

Table A-35 Contaminated Site Informational Annual LAs for Unimpaired Segments for the PAH 2 Group

Segment	Contaminated Site	LA (g/year)
Watts Branch	Kenilworth Park Landfill North	0
Fort Dupont Creek	CSX	0

Table A-38 Contaminated Site Annual Informational LAs for Unimpaired Segments for the PAH 3 Group

Segment	Contaminated Site	LA (g/year)
Watts Branch	Kenilworth Park Landfill North	0
Fort Dupont Creek	CSX	0

MSGP Informational WLAs for Unimpaired Segments

Table A-39 Informational Daily WLAs for Individual MSGP Facilities for Unimpaired Segments

Segment	Facility	Drains To	Arsenic (g/day)	Chlordane (g/day)	Dieldrin (g/day)	Heptachlor Epoxide (g/day)
Hickey Run	DCR053008	MS4	0.48	1.22E-03	0	2.33E-04
	DCR053030	MS4	0.49	1.27E-03	0	2.42E-04
	DCR053043	MS4	0.10	2.63E-04	0	5.02E-05
	DCR053046	MS4	0.08	2.08E-04	0	3.96E-05
	DCR05J000	MS4	0.20	5.01E-04	0	9.57E-05
	DCR05J003	MS4	0.23	5.97E-04	0	1.14E-04
Anacostia #2[1]	DCR05J004	MS4	-	4.35E-02	-	-
Anacostia #1[2]	DCR050002	MS4	-	-	-	-
	DCR053010	Anacostia River	-	-	-	-
	DCR053015	CSS	-	-	-	-
	DCR053016	MS4	-	-	-	-
	DCR053018	Anacostia River	-	-	-	-
	DCR053024	MS4	-	-	-	-
	DCR053030	CSS	-	-	-	-
	DCR053056	Anacostia River	-	-	-	-
	DCR05J000	CSS	-	-	-	-

[1]Anacostia #2 is listed as impaired for arsenic, dieldrin, and heptachlor epoxide and the WLAs for each MSGP facility for those pollutants are in a separate table in Section 6.6.

[2]Anacostia #2 is listed as impaired for arsenic, chlordane, dieldrin, and heptachlor epoxide and the WLAs for each MSGP facility for those pollutants are in a separate table in Section 6.6.

Table A-36 Informational Annual WLAs for Individual MSGP Facilities for Unimpaired Segments

Segment	Facility	Drains To	Arsenic (g/year)	Chlordane (g/year)	Dieldrin (g/year)	Heptachlor Epoxide (g/year)
Hickey Run	DCR053008	MS4	1.70	7.80E-03	0	9.94E-04

	DCR053030	MS4	1.76	8.08E-03	0	1.03E-03
	DCR053043	MS4	0.37	1.68E-03	0	2.14E-04
	DCR053046	MS4	0.29	1.32E-03	0	1.69E-04
	DCR05J000	MS4	0.70	3.20E-03	0	4.08E-04
	DCR05J003	MS4	0.83	3.81E-03	0	4.86E-04
Anacostia #2[1]	DCR05J004	MS4	-	2.92E-02	-	-
Anacostia #1[2]	DCR050002	MS4	-	-	-	-
	DCR053010	Anacostia River	-	-	-	-
	DCR053015	CSS	-	-	-	-
	DCR053016	MS4	-	-	-	-
	DCR053018	Anacostia River	-	-	-	-
	DCR053024	MS4	-	-	-	-
	DCR053030	CSS	-	-	-	-
	DCR053056	Anacostia River	-	-	-	-
	DCR05J000	CSS	-	-	-	-

[1]Anacostia #2 is listed as impaired for arsenic, dieldrin, and heptachlor epoxide and the WLAs for each MSGP facility for those pollutants are in a separate table in Section 6.6.

[2]Anacostia #2 is listed as impaired for arsenic, chlordane, dieldrin, and heptachlor epoxide and the WLAs for each MSGP facility for those pollutants are in a separate table in Section 6.6.

Appendix B: CLIMATE CHANGE SCENARIO METHODOLOGY AND RESULTS

Climate Change Analysis for the Anacostia River Watershed Toxics TMDL

Contract: 68HERC20D0016
March 14th, 2023

PRESENTED TO

US Environmental Protection Agency, Region 3,

District of Columbia Department of Energy and Environment,

PRESENTED BY

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TASK 2 SUMMARY

Tetra Tech developed Loading Simulation Program C++ (LSPC) model simulations for watershed loading and Environmental Fluid Dynamics Code (EFDC) model simulations for hydrodynamic and fate and transport modeling of toxic constituents in the Anacostia River watershed for two time horizons: a near-term horizon around 2035 and a long-term horizon around 2055. Land use and land cover, TMDL allocation pollutant loads, and initial and boundary conditions remained identical to the 2014-2017 TMDL allocation scenario. Tetra Tech used projections of precipitation quantity and intensity, air temperature, and sea level rise from datasets generated by the Chesapeake Bay Modeling Workgroup (CBMW) in 2017 and 2019 (Shenk, et al., 2021) to represent the two time horizons, with suitable modifications as needed.

CONTENTS

ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
CBMW	Chesapeake Bay Modeling Workgroup
CMIP5	Coupled Model Intercomparison Project 5
CWA	Clean Water Act
DCA	Ronald Reagan Airport
DOEE	District Department of Energy and the Environment
EFDC	Environmental Fluid Dynamics Code
EPA	Environmental Protection Agency
ET	Evapotranspiration
LSPC	Loading Simulation Program C++
LULC	Land Use Land Cover
NOAA	National Oceanic and Atmospheric Administration
PAH	Polyaromatic Hydrocarbon
SLR	Sea Level Rise
RCP	Representative Concentration Pathway
TMDL	Total Maximum Daily Load
USGS	United States Geological Survey
VU	Verification Unit

1.0 INTRODUCTION

The United States Environmental Protection Agency (EPA) Region 3 coordinated with the District of Columbia Department of Energy and Environment (DOEE) to replace existing total maximum daily loads (TMDLs) for toxic impairments (metals, organochlorine pesticides, and polycyclic aromatic hydrocarbons [PAHs]) in the Anacostia River, its tributaries, and Kingman Lake. The Anacostia River was originally listed as impaired on the District of Columbia's 1998 Clean Water Act (CWA) Section 303(d) list. TMDLs were developed for those listings in 2003, but they were later challenged in court because they did not include a daily load expression. A subsequent court order set a date for the vacatur of EPA's approval of the existing TMDLs. In 2017 the court order was amended to extend that deadline three times: first, until January 31, 2020, then until September 30, 2021, and finally, until April 1, 2024. In addition, during that time a Remedial Investigation conducted under the Anacostia River Sediment Project resulted in the development of a large monitoring dataset to better characterize surface waters, bed sediment, pore water, manhole sediment quality, and tributary loading of sediment and contaminants in the watershed. Further, DOEE has published an interim Record of Decision to reduce sediment contamination at 11 different sites in the Anacostia River.

Tetra Tech delivered a TMDL load allocation and attenuation analysis on March 17, 2021. Consequently, draft replacement TMDLs were released for public notice and comment on July 9, 2021. As a result of comments raised by the public, EPA Region 3 and DOEE are spending additional time to analyze the effects of climate change on the draft TMDLs and attenuation of toxic pollutants in the Anacostia River. Under a contract with EPA Region 3, Tetra Tech has been tasked with performing this analysis. This report describes modeling that has been undertaken by Tetra Tech for EPA and DOEE to perform an analysis of the effects of climate change on the TMDLs and on the attenuation of toxic pollutants in the Anacostia River, its tributaries, and Kingman Lake following implementation of the TMDL allocations.

2.0 TASK 2 SCOPE OF WORK

Tetra Tech simulated the fate and transport of ten toxic pollutants/pollutant groups under conditions of climate induced changes in precipitation quantity and intensity, air temperature, and sea level rise (SLR). These are the three principal drivers of hydrometeorological change in this system (see Section 3.4 below). The projected climate change effects and time horizons selected for this analysis were chosen to be consistent with the Chesapeake Bay Program's medium- to long-term planning outlook (Shenk, et al., 2021). Therefore, the analysis assumes that climate change will occur according to the Coupled Model Intercomparison Project 5's (CMIP5) stabilization Representative Concentration Pathway (RCP) (Van Vuuren, et al., 2011) in which radiative forcing stabilizes to 4.5W/m^2 before the year 2100 (RCP 4.5) for two four-year periods, namely, 2034-2037 and 2054-2057, henceforth labeled the 2035 and 2055 time horizons. A brief description of these scenarios is given in Table 2-1. In this analysis, these periods respectively represent one near-term and one long-term time horizon.

Table 2-1. Crosswalk between scenarios defined in this report, Tetra Tech modeling report, and CBMW climate change report.

Scenario	Period	Description	Relationship to Tetra Tech TMDL modeling report	Relationship to CBMW analysis
TMDL baseline	2014-2017	Baseline current pollution conditions without TMDL load allocations, and <u>not used in this report</u>.	TMDL baseline scenario	NA

Scenario	Period	Description	Relationship to Tetra Tech TMDL modeling report	Relationship to CBMW analysis
TMDL allocation	2014-2017	Assigned TMDL load allocations, treated as the "baseline" for this study	TMDL load allocation scenario	NA
Near-term or 2035 climate change	2034-2037	Assigned TMDL load allocations with climate change projections at 2035	NA	Linear interpolation of climate projections at 2016 between CBMW's "baseline" in 1995 and their "near-term" scenario at 2025 + change between their "medium-term" scenario at 2035 and near-term scenario.
Long-term or 2055 climate change	2054-2057	Assigned TMDL load allocations with climate change projections at 2055	NA	Linear interpolation of climate projections at 2016 between CBMW's baseline and their near-term scenario + change between their "long-term" scenario at 2055 and near-term scenario.
2035 climate change natural attenuation	2034-2037	Assigned TMDL allocations and estimates of natural attenuation timeframes of toxic bed sediments under climate change projections at 2035	NA	Linear interpolation of climate projections at 2016 between CBMW's "baseline" in 1995 and their "near-term" scenario at 2025 + change between their "medium-term" scenario at 2035 and near-term scenario.
2055 climate change natural attenuation	2054-2057	Assigned TMDL allocations and estimates of natural attenuation timeframes of toxic bed sediments under climate change projections at 2055	NA	Linear interpolation of climate projections at 2016 between CBMW's baseline and their near-term scenario + change between their "long-term" scenario at 2055 and near-term scenario.

3.0 BACKGROUND

Tetra Tech simulated the fate and transport of the ten toxic pollutants/pollutant groups listed in Table 3-1 below, under conditions of near-term and long-term climate change. To perform a self-consistent and appropriate comparison with previous simulation results (Tetra Tech, 2021), model characteristics other than meteorological and SLR updates were not changed, except for the Potomac River inflow, which will be described below. For example, conditions such as land use and land cover (LULC), tributary and tidal river bathymetry, and toxic pollutants/pollutant groups management and policy were represented identically to the TMDL allocation scenario.

3.1 WATERBODY AND WATERSHED OVERVIEW

The 170-square-mile Anacostia River watershed originates in Montgomery and Prince George's Counties, Maryland, and terminates at the confluence with the Potomac River in the District of Columbia. Approximately 80% of the watershed is in Maryland and 20% is in the District of Columbia. The upper tributaries are nontidal freshwater, while the mainstem of the Anacostia River is tidally influenced. Additional details are available in the

TMDL modeling report (Tetra Tech, 2021). Figure 3.1-1 is a map of the Anacostia River watershed illustrating the modeling domain used to develop the TMDLs and perform the attenuation analysis (Tetra Tech, 2021).

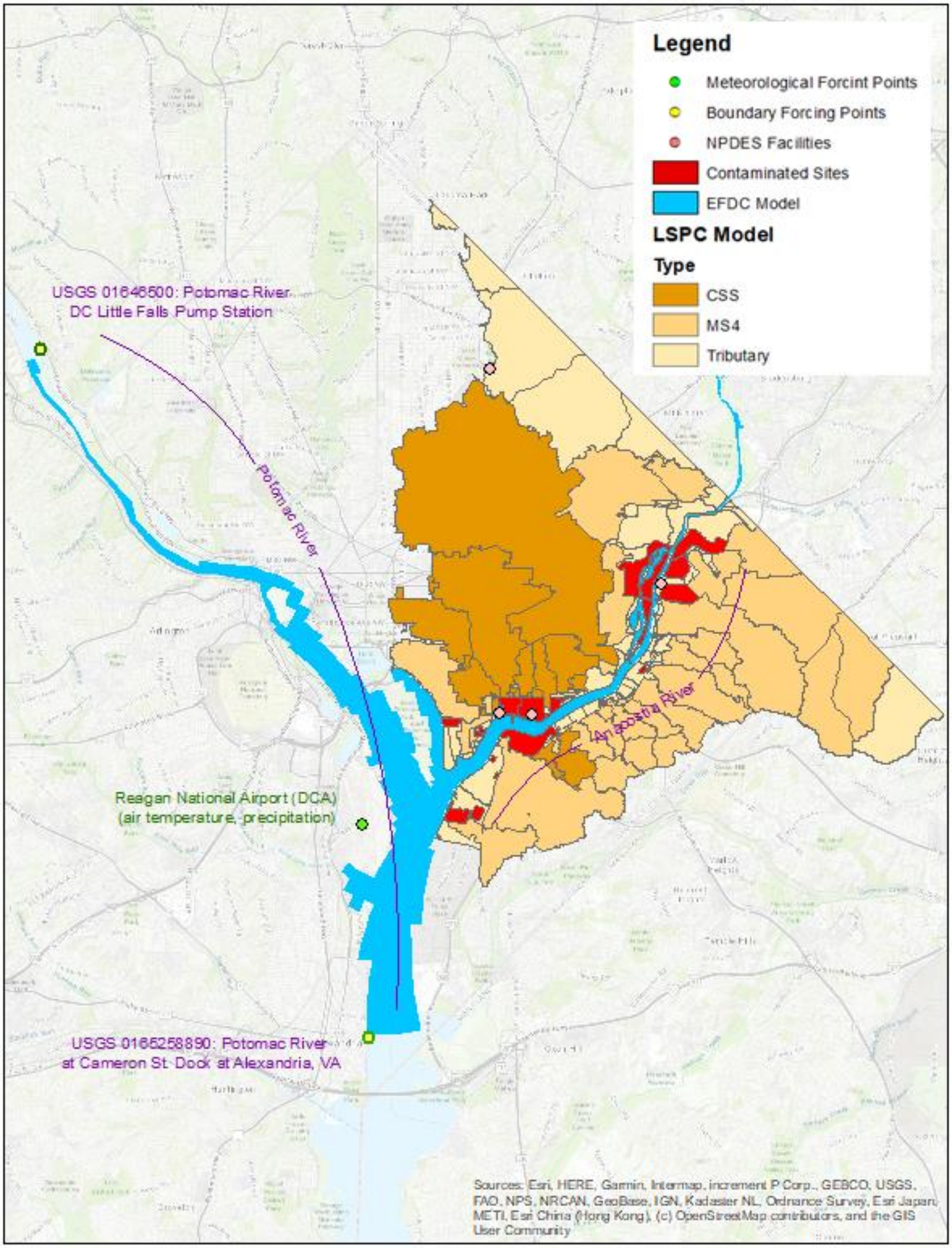

Figure 3.1-1. Anacostia River watershed and LSPC and EFDC model domains within the District of Columbia (Tetra Tech, 2021).

3.2 IMPAIRMENTS AND LISTINGS

CWA sections 303(d) and 305(b) include requirements and responsibilities for states and the District of Columbia related to identifying impaired waters and conducting water quality inventories. The District of Columbia submits Integrated Reports to EPA, which fulfill the requirements of both those sections. To consistently evaluate the impacts of climate change without altering the assumptions in the TMDL allocation scenario, the specific details of the impairments and designated uses remain identical to those listed in the TMDL modeling report (Tetra Tech, 2021). Tetra Tech simulated the fate and transport of the ten toxic pollutants/pollutant groups listed in Table 3-1.

Table 3-1. Toxic constituents that were simulated

Number	Pollutant Group (where applicable)	Pollutant
1	--	Arsenic
2	--	Copper
3	--	Zinc
4	--	Chlordane
5	--	Dieldrin
6	DDT	4,4'-DDD
		4,4'-DDE
		4,4'-DDT
7	--	Heptachlor Epoxide
8	PAH 1 (2+3 ring)	Acenaphthene
		Anthracene
		Naphthalene
		Fluorene
9	PAH 2 (4 ring)	Benzo[a]anthracene
		Chrysene
		Fluoranthene
		Pyrene
10	PAH 3 (5 + 6 ring)	Benzo[a]pyrene
		Benzo[b]fluoranthene
		Benzo[k]fluoranthene
		Dibenzo[a,h]anthracene
		Indeno[1,2,3-c,d]pyrene

3.3 WATERSHED AND RIVER MODELING

The LSPC model was used to simulate surface and subsurface runoff, sediment transport, and pollutant loads from the watershed and the hydraulics of the nontidal portion of the Anacostia River (Figure 2.1-1) (Tetra Tech, 2021). The LSPC model was used to provide updated loads based on the altered precipitation quantities and intensities under the future climate projections and the TMDL allocation scenario. The stormwater, sediment influxes and loads from the LSPC model were applied to the EFDC model of the tidal Anacostia River (Figure 3.1-1). In this region, the tidal influences from the Potomac River and the wider river channel with more complex bathymetry necessitate the use of a three-dimensional hydrodynamic model (Tetra Tech, 2021). Therefore, the sediment transport and the fate and transport of each of the toxic pollutants/pollutant groups listed in Table 3-1 were modeled using LSPC in the nontidal Anacostia River and using EFDC in the tidal Anacostia River.

To remain consistent with the assumptions of the TMDL allocation scenario (see Section 4.0 below), the coupled LSPC-EFDC model was run for each of the toxic pollutants/pollutant groups without modifying the LULC or pollutant sources. Only the principal hydrometeorological forcing variables were updated using the climate change projections for the Chesapeake Bay. Further, the model structure, including the representation of the hydrologic response units in LSPC and the grid in EFDC remained unaltered. To directly compare the timeseries of the model results between the TMDL allocation scenario and the future time horizons, four-year model runs were performed as stated in Section 2.0 above. The details of the model setup are presented in Sections 3.0 and 4.0 in the TMDL modeling report (Tetra Tech, 2021).

3.4 CLIMATE CHANGE ASSUMPTIONS AND LIMITATIONS

The analysis primarily utilized climate change projections for monthly air temperature and precipitation quantity and intensity, sea level rise, and flow and water temperature changes in the Potomac River, developed by the CBMW in 2017 and 2019 (Shenk, et al., 2021). This approach was adopted to align the future horizons as closely as possible to a larger regional modeling effort. As the CBMW projected climate change future horizons from a Chesapeake Bay Climate baseline in the mid-1990s (midpoint in year 1995), and the TMDL allocation scenario investigated earlier is the period between 2014 and 2017 (midpoint in year 2016), the following reasoning is applied to adopt a common baseline period and ultimately develop an Anacostia River climate baseline (the TMDL allocation scenario in Table 2-1) representing the more recent timeframe. The Chesapeake Bay climate baseline and Anacostia River climate baseline representations discussed for this work relate to climate representation and are distinct from the TMDL baseline pollutant loading scenario for the Anacostia River Toxic Constituents TMDL (see Table 2-1; Tetra Tech, 2021).

The CBMW projected air temperature, precipitation, and SLR in 2025 from the historic records such that a linear trend in the changes to these quantities in each month of the year is well justified over the period of 1995 to 2025 (Shenk, et al., 2021). Therefore, all the shifts in meteorological conditions between 1995 and 2025 will be adjusted to those between 1995 and 2016 by linearly interpolating these shifts until 2016 (see below). Consequently, all the shifts used in this study for climate projections will be relative to the TMDL allocation scenario reported earlier (Tetra Tech, 2021). In this analysis, the climate change effects on solar radiation, cloud cover, and wind will not be considered because they were not studied by the CBMW. There is much uncertainty in the approaches related to climate change effects on wind speed, making future projections unreliable (Wohland, Omrani, Witthaul, & Keenlyside, 2019). The SLR-impacted tidal water surface elevations in the Potomac River at the future time horizons will be obtained directly from the CBMW's estuarine model's outputs from the grid cell corresponding to Alexandria, VA on the Potomac River.

Meteorological forcings. Meteorological data that were used include precipitation, potential evapotranspiration (ET), air temperature, dew point temperature, wind speed, cloud cover, and solar radiation. As reported in the TMDL modeling report, hourly temperature records from the Washington Reagan Airport (DCA) (Tetra Tech, 2021), adjusted by additive constants corresponding to the month during which the records occur were used for air temperature. Hourly precipitation records from DCA, adjusted by multiplicative constants corresponding to the month during which the records occur, and further modified by the CBMW's "Delta method" (Shenk, et al., 2021) to represent intensification of wet spells were used for precipitation. These constants are shown in Table 3-2. The rationale behind the additive constants for air temperature is that the CBMW reported median air temperature change values (Shenk, et al., 2021), so that

$$\boldsymbol{T_{i,j}(t) = T(t) + d_{i,j}} \qquad (1)$$

where $T(t)$ is the hourly air temperature record at DCA, $d_{i,j}$ is the additive constant temperature rise corresponding to the future time horizon i in month j, and $T_{i,j}(t)$ is the synthetic hourly air temperature record that will be created for the climate change analysis.

The additive constants for air temperature, obtained from the CBMW (Gopal Bhatt, CBMW, personal communication), were the median delta change for the District of Columbia for each of the future time horizons from which a fraction of the median delta change for the 2014-2017 time horizon was subtracted for each month. This was accomplished as follows:

$$d_{ij} = \underbrace{d_{ij}^{i-1990s}}_{\substack{\text{Additive rise} \\ \text{from 1990s} \\ \text{to horizon } i}} - \underbrace{\frac{21}{30} d_{2025j}^{2025-1990s}}_{\substack{\text{Linear interpolation of additive} \\ \text{rise to conditions in 2016 using} \\ \text{trend from 1995−2025}}}$$

The rationale behind the multiplicative constants for monthly precipitation quantity is that the CBMW reported median percent changes in these values (Shenk, et al., 2021),

$$\boldsymbol{Q_{i,j} = b_{i,j} Q_j; b_{i,j} = \left(1 + \frac{\tilde{p}_{i,j}}{100}\right)} \tag{2}$$

where $Q_{i,j}$ is the total quantity of precipitation in future time horizon i in month j, Q_j is the is the total quantity of precipitation in under the TMDL allocation scenario in month j, $b_{i,j}$ is the multiplicative constant precipitation change factor corresponding to the future time horizon, and $\tilde{p}_{i,j}$ is the percent change in precipitation from the TMDL allocation scenario. Hence, the change in quantity of precipitation in future time horizon i in month j will be

$$\Delta Q_{i,j} = \frac{\tilde{p}_{i,j}}{100} Q_j$$

The constants for precipitation, obtained from the CBMW (Gopal Bhatt, CBMW, personal communication), were the median delta change for the District of Columbia for each of the future time horizons from which a fraction of the median delta change for the 2014-2017 time horizon was subtracted for each month. These were used to obtain a $\boldsymbol{\tilde{p}_{i,j}}$ value for each month, which was then modified using the second part of Equation **Error! Reference source not found.** to obtain a $b_{i,j}$ value for each month. This is

$$\tilde{p}_{ij} = \left(p_{ij} - \frac{21}{30} p_{2025j}\right)$$

Here, p_{ij} is the percent change in precipitation from the Chesapeake Bay Climate Baseline circa the 1990s. The rationale behind the application of the Delta method for quantifying precipitation intensification is that rainfall events over the 20th century have intensified non-uniformly, such that the most intense rainfall events have increased more than the least intense rainfall events.

The CBMW's Delta method was also used to represent the intensification of precipitation due to climate change in a sequence of four steps (Gopal Bhatt, CBMW, personal communication):

1. First, it was noted that the observed changes in rainfall intensity over the 20th century in Chesapeake Bay were grouped into deciles and reported by the CBMW in their Figure 2-7 are $dI_{i=\{1,2,\cdots,10\}}$ = 2.9%, 2.9%, 2.9%, 2.9%, 2.9%, 2.3%, 1.2%, 5.8%, 11.7% and 64.3% (Shenk, et al., 2021). That is, the intensities of the lowest 10% of nonzero precipitation events increased on average by $dI_1 = 2.9\%$, those of the next highest 10% of nonzero precipitation events increased on average by $dI_2 = 2.9\%$, and so on, until those of the second highest 10% of nonzero precipitation events increased on average by $dI_9 = 11.7\%$. and those of the highest 10% of nonzero precipitation events increased on average by $dI_{10} = 64.3\%$.
2. Second, the hourly timeseries of precipitation records from 2014 to 2017 were separated into zero precipitation and nonzero precipitation events, and the nonzero precipitation events were ranked from lowest, $r = 1$, to highest, $r = 10$.
3. Third, the ranked nonzero precipitation events were grouped into decile or 10-percentile bins.
4. Fourth, the precipitation record, $P(t)$, at time t from DCA station in month j which is either zero or nonzero and falling in bin r is applied to the identical timestamp in the future time horizon i as

$$\boldsymbol{P_{i,j}(t)} = \begin{cases} \boldsymbol{0} & ; \boldsymbol{P(t) = 0} \\ \boldsymbol{P(t) + \Delta Q_{i,j} \cdot \frac{dI_r(t)}{\sum_{q=1}^{m} dI_q} \cdot \frac{1}{n_r}} & ; \boldsymbol{P(t) \neq 0} \end{cases} \tag{3}$$

where $P_{i,j}(t)$ is the synthetic hourly precipitation record that will be created for the climate change analysis, $dI_r(t)$ is the observed intensification rate of precipitation events in the r^{th} decile bin the precipitation record $P(t)$ falls into, and n_r is the number of precipitation records in month j that fell into the r^{th} decile bin.

The rationale is that the total precipitation in in month j computed using Equation **Error! Reference source not found.** will be

$$Q_{i,j} = \sum_{t=1}^{m} P_{i,j}(t) = \sum_{t=1}^{m} P(t) + \frac{\Delta Q_{i,j}}{\sum_{q=1}^{m} dI_q} \sum_{t=1}^{m} \frac{dI_r(t)}{n_r} = Q_j + \Delta Q_{i,j}$$

The last summation over all precipitation records is equivalent to a summation over all the decile bins into which precipitation records fall into in that month as

$$\sum_{t=1}^{m} \frac{dI_r(t)}{n_r} = \sum_{q=1}^{m} \frac{n_q dI_q}{n_q} = \sum_{q=1}^{m} dI_q$$

as there are n_q records in the q^{th} decile bin in that month. So, the change in quantity of precipitation in future time horizon i in month j is recovered using Equation **Error! Reference source not found.**.

While the use of these formulations is extremely simple and does not account for stochasticity in hourly meteorological patterns, the use of these "shifted" timeseries is appropriate because, the flushing time of the Anacostia River is typically about 20 days and can range up to 100 days during prolonged droughts (Interstate Commission on the Potomac River Basin, 1988). So, hourly variability within each month will be averaged out.

Table 3-2. Additive and multiplicative meteorological constants for climate change analysis.

	Future time horizon	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Air temperature, d_{ij} (°C)	2035	0.76	0.71	0.49	0.78	0.67	0.60	0.68	0.75	0.77	0.61	0.57	0.69
	2055	1.21	1.36	0.99	1.19	1.39	1.39	1.35	1.35	1.32	1.49	0.84	1.22
Precipitation, $\tilde{p}_{i,j}$	2035	0.031	0.041	0.005	0.038	0.021	0.030	0.038	0.051	0.032	0.013	0.005	0.086
	2055	0.037	0.077	0.025	0.058	0.068	0.047	0.025	0.062	0.025	0.040	0.057	0.117
Sea level rise, $h_{i,j}$ (m)	2035	0.188	0.182	0.184	0.184	0.185	0.187	0.187	0.187	0.188	0.189	0.188	0.195
	2055	0.444	0.440	0.444	0.441	0.445	0.449	0.449	0.450	0.451	0.454	0.452	0.461

Hydrologic forcings from the watershed. The LSPC model provides overland and subsurface runoff and sediment and pollutant loads corresponding to the altered precipitation quantities and intensities under the future climate projections and the TMDL allocation scenario. The USGS monitoring station location 01646500 near Little Falls along the upstream Potomac River (Figure 3-2) is used to provide freshwater inflows to the Potomac River as a non-modeled boundary condition in the TMDL modeling. Based on estimates presented in Figure 4-29 of the CBP Modeling Workgroup Report, streamflow and water temperature for the Potomac River were increased to reflect both near-term and long-term climate change conditions. Streamflow rates at the Little Falls boundary were uniformly increased by 2.7% and 6.25% for 2035 and 2055 scenarios, respectively.

Estimates for water temperature increase on the Potomac River were not presented. Instead, water temperature increases based on results from the Anacostia River LSPC model were applied to the Potomac River. The water temperature boundary was uniformly increased by 1.9% and 3.6% for the 2035 and 2055 scenarios, respectively.

Sea level rise and the tidal boundary at Alexandria, VA. The primary drivers of mixing and estuarine circulation in the Chesapeake Bay and its tributaries, including the Potomac River, are likely freshwater inflows, change in tidal amplitudes, and relative SLR (Ross, Najjar, & Li, 2021). Therefore, in this analysis, the effects of these variables are isolated and considered. The relative SLR (RSLR) is the SLR relative to the vertical movement of the land nearby (USEPA, 2021). The instantaneous tidal water surface elevations measured at the USGS tide gage at the Potomac River at Cameron Station Dock at Alexandria in Virginia (monitoring station location 0165258890, see Figure 3-2) were used (USGS, 2022) between 2014 and 2017 shifted additively by the constants shown in **Error! Reference source not found.**. The rationale behind the additive constants to account for SLR is that the CBMW reported median air temperature change values (Shenk, et al., 2021), so that

$$\boldsymbol{H_{i,j}(t) = H(t) + h_{i,j}} \qquad (4)$$

where $H(t)$ is the hourly water surface elevation above a given datum at the USGS tide gage at the Potomac River at Cameron Station Dock at Alexandria in Virginia (monitoring station location 0165258890) between 2014 and 2017, $h_{i,j}$ is the additive constant SLR corresponding to the future time horizon i in month j, and $H_{i,j}(t)$ is the synthetic hourly water surface elevation record that will be created for the climate change analysis. These constants were read off from the RSLR projections from the Chesapeake Bay estuarine circulation model developed by the CBMW in the grid cell corresponding to the USGS gage 0165258890 which is very close to the free boundary of the EFDC grid at Alexandria, VA (Richard Tian, CBMW, personal Communication). The Chesapeake Bay estuarine circulation model grid is shown overlayed on the TMDL EFDC grid in Figure 3-2. The timeseries of water surface elevations measured from the long-term mean sea surface elevation above a set datum were provided by CBMW for a ten-year period spanning four time horizons centered at 1995, 2025, 2035 and 2055.

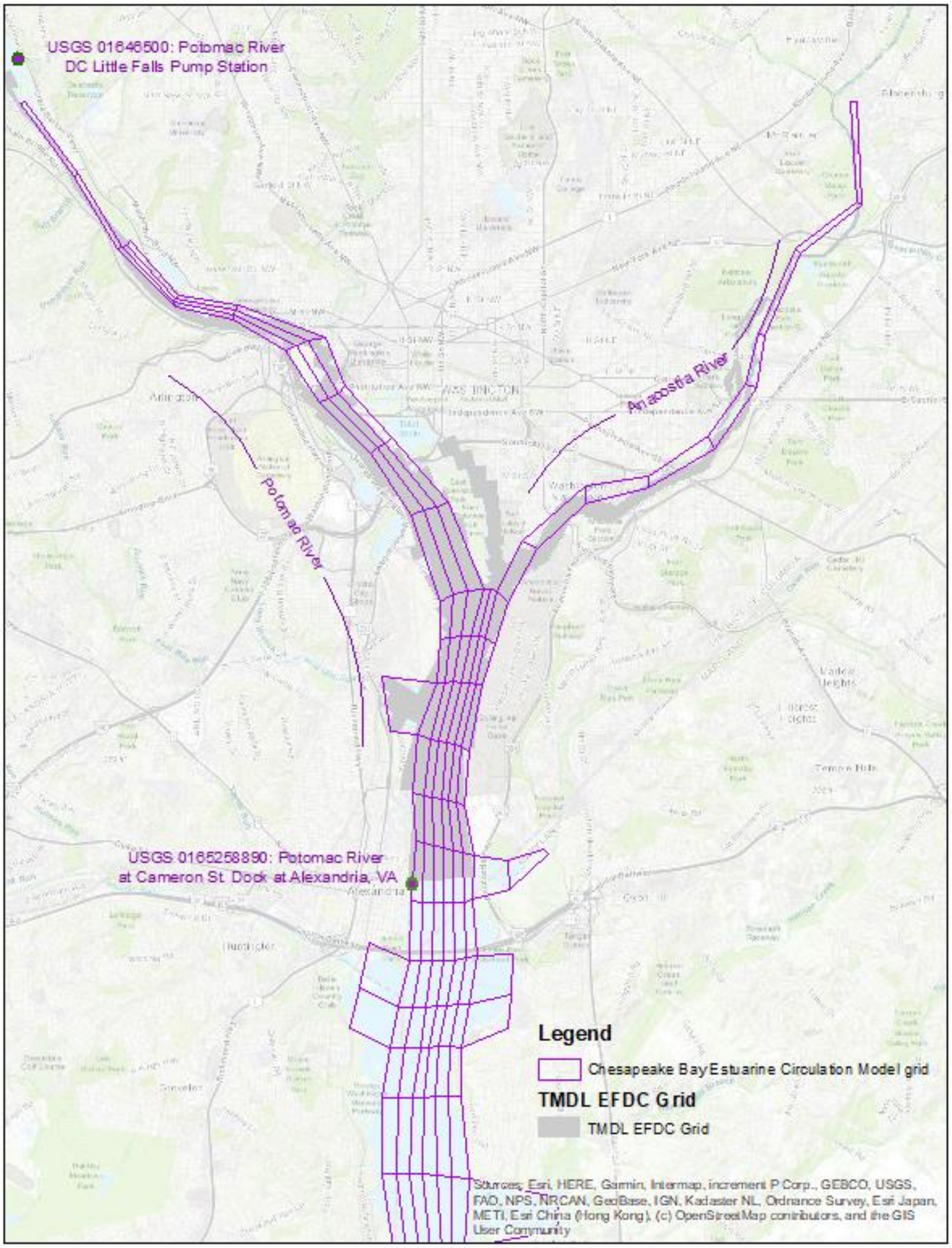

Figure 3-2. Chesapeake Bay estuarine circulation model grid near the confluence of the Potomac River, and locations of USGS gage stations on the Potomac River at Little Falls (USGS 01646500) and at Alexandria's Cameron Street Dock (USGS 0165258890).

Similar to the additive constants for air temperature, the additive constants for SLR were the delta change for the specified computational grid cell for each of the future time horizons from which a fraction of the median delta change for the 2014-2017 time horizon was subtracted for each month. This was accomplished as follows:

$$h_{ij} = \underbrace{h_{ij}^{i-1990s}}_{\substack{\text{Additive rise}\\\text{from 1990s}\\\text{to horizon } i}} - \underbrace{\frac{21}{30} h_{2025j}^{2025-1990s}}_{\substack{\text{Linear interpolation of additive}\\\text{rise to conditions in 2016 using}\\\text{trend from 1995}-2025}} \tag{4}$$

These constants are shown in Table 3-2.

Assumptions and limitations. There are several assumptions and limitations in this climate change analysis. To remain consistent with the CBMW's analysis, this analysis considered the effects of rising air temperature and increasing precipitation quantity and intensity, and alterations to the freshwater inflows, stream temperature, and sediment loads from the Potomac River. It will not consider the effects of other meteorological or water quality drivers, either because they were not included in the CBMW's analysis, or because the projections involve too much uncertainty at the watershed scale (as in the case of windspeed).

In the case of freshwater inflows into the Potomac River, the CBMW's projections in their Figure 4-29 estimated only a nominal increase of about 5% from 2025 to 2050 (Shenk, et al., 2021). Although this increase is very small compared to the volumetric flowrate associated with the RSLR, this change was included to remain consistent with CBMW and leverage regional efforts. As the change in streamflow is minimal, it is not expected that the dilution effect of water temperature to be significantly different from the conditions in the 2014-2017 period. However, changes in the water temperature of the Potomac River were updated as discussed previously based on results of the LSPC watershed model climate change scenarios.

Updated sediment loading for the Potomac is the result of increased flow volumes only, and suspended sediment concentrations were not updated. Additional clean sediment concentrations entering the Potomac River would effectively reduce the attenuation duration of toxic constituents in the tidal Anacostia River sediments. Therefore, by not including a projected increase in the sediment concentration (Shenk, et al., 2021), the analysis conservatively overpredicts the time needed for natural attenuation to occur. This would result in an implicit margin of safety built into the analysis.

In addition, the analysis assumes that the projections of RSLR at Alexandria, VA are identical to those obtained from the CBMW's estuarine model solution at the nearest grid cell to this location. Another assumption is that the hourly timeseries of air temperature, precipitation, and tidal water surface elevations were exactly replicated with additive or multiplicative biases as shown in Equations **Error! Reference source not found.**, **Error! Reference source not found.** and **Error! Reference source not found.**. Under the assumptions of linearity in the climate trends until 2025, the period of 2014 to 2017 were considered as linearly interpolated from the trend between the 1990s and the CBMW's future time horizon of 2025.

4.0 CLIMATE CHANGE AND ATTENUATION SCENARIO DEVELOPMENT

For each future time horizon (2035 and 2055) and for each toxic pollutant/pollutant group in Table 3-1, Tetra Tech conducted two sets of model runs. The first set of runs (Climate Change Scenario) represents conditions in which the TMDL load and wasteload allocations specified in the four-year period between 2014 and 2017 (Tetra Tech, 2021) were implemented. The second set of runs (Climate Change Natural Attenuation Scenario) was designed to estimate how long natural attenuation of toxic constituents in bed sediment will take considering climate change impacts, relative to the natural attenuation results documented in the TMDL.

The Climate Change Scenario runs used the paired LSPC-EFDC model of the TMDL allocation scenario to assess change in water column concentrations for each pollutant/pollutant group for the 2035 and 2055 time horizons. The purpose of these runs is to determine the impacts of climate change on the TMDL allocations, specifically whether and when the TMDL allocations, once implemented, will result in attainment of the TMDL endpoints under future climactic conditions. The Climate Change Natural Attenuation Scenarios are additional model runs performed to represent bed sediment concentrations at existing concentrations (i.e., no reductions to bed sediment) and retaining landside TMDL allocations. The purpose of the second set of runs is to estimate the change in bed sediment attenuation as a result of climate change and the impact of natural attenuation on the achievement of the TMDL endpoints. This results in a total of 20 LSPC runs and 40 EFDC runs across the two future time horizons for the 10 toxic pollutants/pollutant groups.

For the Climate Change Scenarios, the TMDL allocations remained identical to those reported earlier (Tetra Tech, 2021). Similarly, the Climate Change Natural Attenuation Scenario analyses were performed in a manner identical to those completed previously. In these analyses, the model was run for a period of four years and the concentrations of toxic pollutants in the bed sediment were extrapolated linearly to calculate the time needed for existing bed sediment pollutant concentrations to decrease to concentrations that support meeting TMDL endpoints for the water column. In other words, the times for the bed sediment concentrations to meet the bed sediment targets identified in the TMDL were estimated. This step identifies the future year at which natural attenuation may be expected to result in meeting the bed sediment endpoints calculated in the TMDL, and therefore the water column criteria, under climate change conditions.

The attenuation timeframes predicted under each of the two climate change scenarios were then be compared to the attenuation timeframes predicted under the TMDL allocation scenario to see what the effects of climate change will be on the TMDL allocation scenario and predicted water quality attainment. In each future time horizon, i, for each pollutant/pollutant group, p, within each assessment unit, u, the following quantitative metric indicates whether attainment of bed sediment targets, and therefore, the TMDL endpoints, under the climate change scenarios is likely to occur faster than, slower than, or at an approximately equal rate to attainment during the TMDL allocation scenario:

$$\Delta C_{i,p,u} = c_{i,p,u} - c_{p,u}$$

where $c_{i,p,u}$ is the concentration of the pollutant/pollutant group, p, within assessment unit, u, in the future time horizon, i, and $c_{p,u}$ is the concentration of the pollutant/pollutant group, p, within assessment unit, u, in the TMDL allocation scenario. In addition to this quantitative metric, a qualitative color-coded metric given by

$$\Delta A_{i,p,u} = c_{i,p,u} - s_p$$

will indicate for the TMDL endpoint (which is the most stringent water quality criterion for each pollutant/pollutant group, s_p) whether attainment is achieved under the future time horizons.

5.0 CLIMATE CHANGE AND ATTENUATION SCENARIO RESULTS

5.1 CLIMATE CHANGE SCENARIO RESULTS

5.1.1 LSPC Watershed Model Results

The LSPC watershed model was run first to simulate updated temperature and precipitation conditions described in Section 4. Results for each subwatershed of the Anacostia River watershed were obtained and ultimately linked to the EFDC hydrodynamic model representing the tidal portion of the Anacostia River. Simulated streamflows and toxicant loadings from subwatersheds were summarized by pour point, or the points at which tributaries are discharged to the tidal Anacostia River.

The results of the subwatershed aggregation show a variation in pollutant loading, not only by type of toxicant, but by tributary system. For example, Figure 5-1 shows the area-weighted loading rate by contributing watershed in mg/acre/day for the TMDL allocation scenario. An area-weighted loading rate is shown to compare larger watersheds with smaller watersheds by normalizing the acreage. The loading rates vary between watersheds, with higher pesticide loading rates along Northeast Branch Anacostia River, Buzzard Point, and along the Washington Channel. Lower loading rates are clustered along the western side of the tidal Anacostia River, which is serviced by the combined sewer system (CSS), which conveys most of these loads to the Blue Plains Treatment Facility.

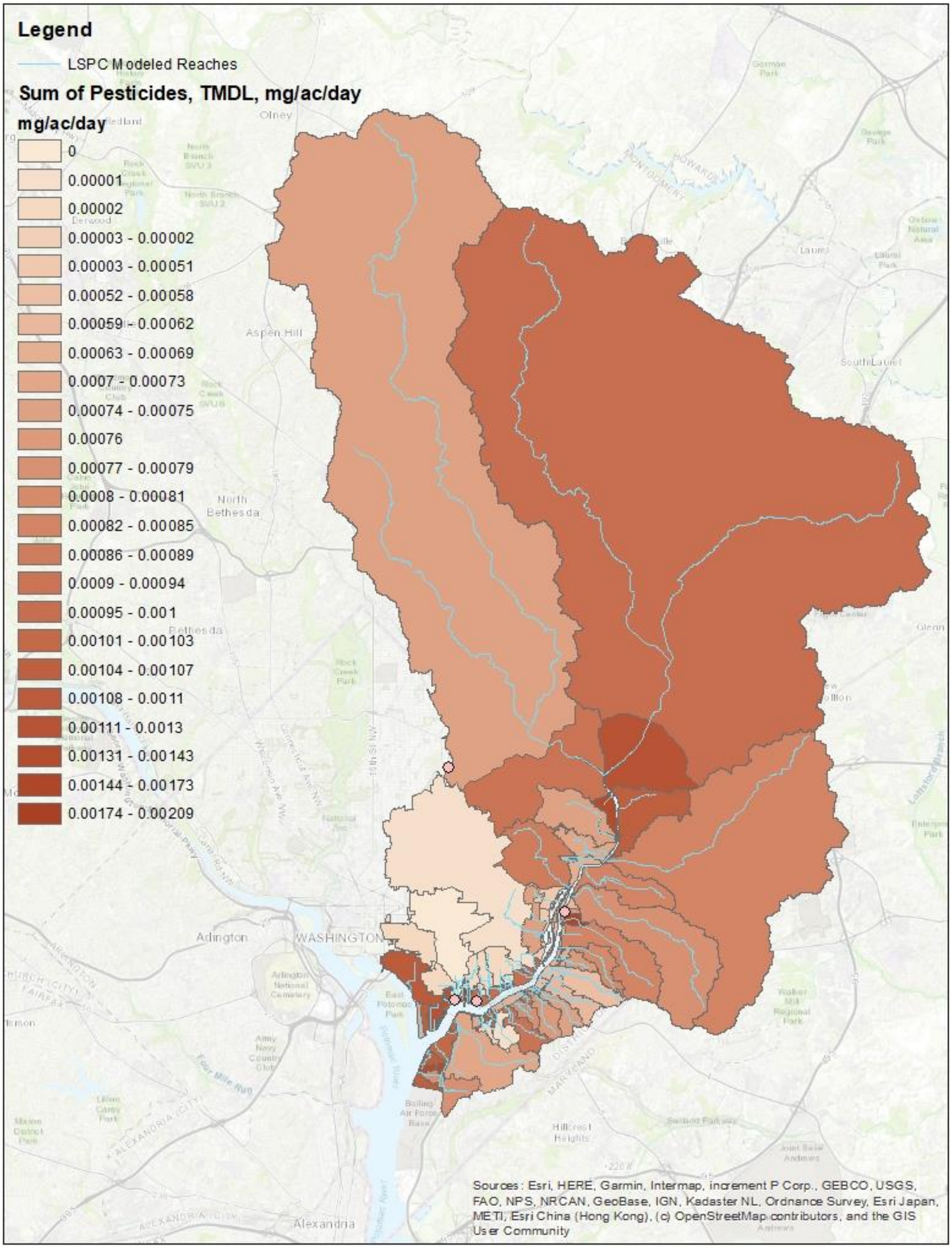

Figure 5-1. Pesticide loading rates (mg/ac/day) by watershed under the TMDL allocation scenario.

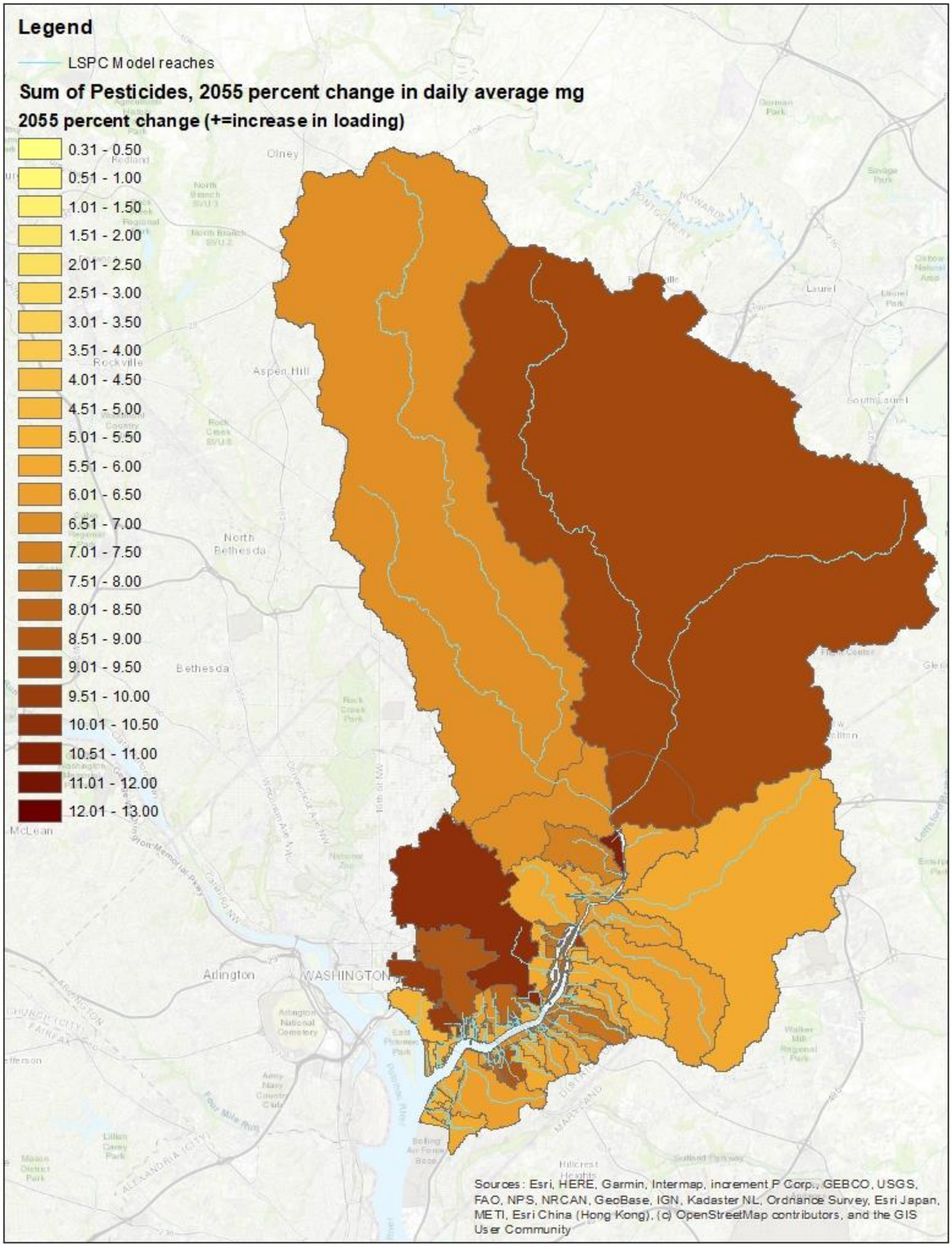

Figure 5-1. Change in pesticide loading rates (percent) by watershed under the 2055 Climate Change Scenario.

Figure 5-2 shows the change in area-weighted pesticide loading for the 2055 climate change scenario. Under the 2055 Climate Change Scenario, total pesticide loading increases in all subwatersheds by between 0.3 and 13%[1]. Lower increases in loading occur in watersheds where previously high loading rates were exhibited. Higher increases generally occur in areas that formerly contributed smaller loads, except for the Northeast Branch Anacostia River. Significantly, the largest percent increases are seen in the CSS watersheds[2], as additional rainfall volume and intensity in these subwatersheds create additional overflows and increase loading to the tidal Anacostia River.

5.1.2 EFDC Model Results

The results of the LSPC watershed modeling of climate change scenarios we linked to the EFDC hydrodynamic model of the Anacostia River to simulate fate and transport in the tidal portion of the study area. As described above in Section 3.4, sea level rise and atmospheric forcings were applied to the EFDC model domain in addition to increased loads from the LSPC watershed model. The discussion below describes the aggregate impact of these climate change components, and the impact on natural attenuation for both near-term and long-term climate impacts.

5.1.2.1 Impacts of Climate Change on Tidal Anacostia River Water Quality

The TMDL analysis segmented the tidal Anacostia River into 16 verification units, or VUs, representing discrete regions of the system in order to acknowledge the variable physical characteristics within the system, as well as levels of contamination of toxic pollutants. As described in the TMDL modeling report, these VUs used the tidal assessment unit boundaries used for impairment listings as a template for subdivision so that each VU can be linked back for assessment purposes.

The results of the near-term (circa 2035) and long-term (circa 2055) climate change scenarios are shown in Table 5.1 and Table 5.2, respectively. These tables show the difference between the TMDL allocation scenario, which is characterized by watershed TMDL allocations and bed sediment reductions that meet TMDL endpoints under existing climate conditions during the modeling period of 2014-2017, and the climate change scenarios which take into account predicted climactic conditions. Tables 5.1 and 5.2 present the comparison of water column concentrations across VUs in the tidal Anacostia River and across the 10 pollutants/pollutant groups with the maximum 30-day average concentration as a metric.

[1] Changes in area-weighted pesticide loading for the 2035 climate change scenario are less substantial than those in 2035 (not shown), but follow similar trends.

[2] It is important to note that the basis for comparison is the 2014-2017 time period. Beginning in March of 2018, a portion of the CSS in the Anacostia River watershed was connected to the Anacostia River Tunnel, which has significantly reduced overflows to the tidal Anacostia River due to its storage capacity and conveyance to Blue Plains Advanced Wastewater Treatment Plant. The conveyance was not updated in these scenarios in order to isolate the impacts of climate change.

Table 5.1 Comparison of the TMDL allocation scenario and near-term 2035 climate change scenario water column results for the tidal Anacostia River by VU and toxicant.

2035 Climate Change Scenario	Pollutant:	Heptachlor epoxide	Chlordane	Dieldrin	DDT	Arsenic	Copper	Zinc	PAH1	PAH2	PAH3	
	TMDL Endpoint (ug/l):	3.20E-05	3.20E-04	1.20E-06	1.80E-05	0.14	8.96	117.18	50.00	1.30E-03	1.30E-04	
	Bed Target (ug/kg):	3.55E-01	-	-	-	-	-	-	-	-	-	
	Verification Unit	Change in Maximum 30-day Average Concentration (%)										Average:
Upstream	MD Northwest Branch-1	2.4%	0.8%	-0.2%	1.8%	2.4%	0.2%	2.4%	3.3%	1.1%	1.0%	1.5%
	MD Tidal Anacostia-1	3.8%	3.3%	-2.9%	2.8%	0.2%	0.5%	-1.5%	-4.4%	-1.7%	-1.5%	-0.2%
	Anacostia #2-10	3.7%	3.2%	-4.3%	2.8%	-0.2%	-1.3%	-2.5%	-4.8%	-2.3%	-1.9%	-0.7%
	Anacostia #2-9	3.7%	3.3%	-5.8%	2.9%	-2.7%	-2.2%	-4.9%	-6.5%	-4.6%	-4.4%	-2.1%
	Anacostia #2-8	3.7%	3.2%	-6.7%	2.8%	-3.4%	-2.8%	-6.2%	-4.0%	-5.9%	-5.6%	-2.5%
	Kingman Lake-2	3.6%	3.3%	-4.8%	3.0%	-1.2%	-0.9%	-0.4%	-10.1%	-1.6%	-1.8%	-1.1%
	Anacostia #2-7	4.0%	3.6%	-6.5%	3.2%	-3.7%	-2.5%	-5.4%	-6.3%	-5.6%	-5.3%	-2.4%
	Anacostia #2-6	1.0%	4.4%	-5.5%	4.0%	-3.6%	-1.7%	-4.6%	-10.4%	-4.9%	-4.3%	-2.6%
	Kingman Lake-1	4.6%	4.4%	-5.8%	4.0%	-2.4%	-1.5%	-3.7%	-12.1%	-4.1%	-3.9%	-2.1%
	Anacostia #2-5	0.1%	4.4%	-5.0%	4.1%	-3.1%	-1.5%	-3.9%	-16.3%	-4.3%	-3.5%	-2.9%
	Anacostia #2-4	0.1%	4.2%	-4.7%	3.8%	-2.5%	-1.4%	-3.8%	-18.2%	-3.5%	-3.2%	-2.9%
	Anacostia #2-3	-0.6%	4.3%	-4.4%	2.2%	-2.2%	-1.6%	-4.1%	-14.7%	-3.6%	-3.2%	-2.8%
	Anacostia #2-2	-1.2%	4.3%	-4.3%	1.0%	-2.0%	-1.6%	-4.2%	-13.5%	-3.4%	-3.1%	-2.8%
	Anacostia #2-1	-1.2%	4.3%	-4.2%	-0.5%	-1.8%	-1.5%	-4.2%	-12.3%	-3.3%	-3.0%	-2.8%
	Anacostia #1-2	-0.9%	4.1%	-3.8%	-0.4%	-1.2%	-1.5%	-4.4%	-8.5%	-2.9%	-2.6%	-2.2%
Downstream	Anacostia #1-1	3.9%	3.6%	-1.3%	-0.1%	-0.3%	-1.6%	-3.7%	0.3%	-1.4%	-1.2%	-0.2%
	Average:	1.9%	3.7%	-4.4%	2.3%	-1.7%	-1.4%	-3.4%	-8.7%	-3.3%	-3.0%	

30-day avg concentration decrease >5%
30-day avg concentration increase >5%
Exceeds TMDL Endpoint

While the results of the LSPC simulations suggest that additional toxicant loads are generated under climate change conditions for both near-term and long-term scenarios, the tidal Anacostia River receiving these loads shows improvement in some areas for some pollutant groups. The results of the comparison show variability across pollutants, and also by location in the tidal Anacostia River system. For both the 2035 and 2055 climate change scenarios, PAH concentrations improve downstream of the upstream-most VU, as do metals in general. Pesticides, on the other hand, tend to increase in concentration, except for dieldrin. Dieldrin improvements track similarly to the PAH groups. Locationally, VUs downstream of the Anacostia 2-7 VU are negatively impacted by climate change, likely due to increased CSS contributions in this region that were discussed in Section 5.1.1. This is particularly evident in the 2055 scenario where there is a greater intensification of precipitation. Furthermore, although there are increases in toxicant concentrations in these areas, only one toxicant in one verification unit exceeds the TMDL endpoint under the TMDL allocations and bed sediment reductions called for in the TMDLs. The maximum 30-day average heptachlor epoxide concentrations exceed the TMDL endpoint in the Anacostia 1-1 VU in the 2055 climate change scenario. This is the only VU and pollutant that would exceed the water column TMDL endpoint under near-term or long-term climate change conditions under the TMDL allocations and bed sediment reductions called for in the TMDLs.

Table 5.2 Comparison of the TMDL allocation scenario and long-term 2055 climate change scenario water column results for the tidal Anacostia River by VU and toxicant.

2055 Climate Change Scenario	Pollutant:	Heptachlor epoxide	Chlordane	Dieldrin	DDT	Arsenic	Copper	Zinc	PAH1	PAH2	PAH3	
	TMDL Endpoint (ug/l):	3.20E-05	3.20E-04	1.20E-06	1.80E-05	0.14	8.96	117.18	50.00	1.30E-03	1.30E-04	
	Bed Target (ug/kg):	3.55E-01	-	-	-	-	-	-	-	-	-	
	Verification Unit	Change in Maximum 30-day Average Concentration (%)										Average:
Upstream	MD Northwest Branch-1	2.5%	3.2%	1.6%	4.8%	6.3%	3.0%	8.3%	9.3%	4.9%	4.4%	4.8%
	MD Tidal Anacostia-1	4.4%	3.8%	-6.0%	3.1%	0.4%	3.8%	-1.2%	-9.3%	-2.9%	-2.6%	-0.7%
	Anacostia #2-10	4.6%	3.9%	-9.5%	3.3%	0.3%	-0.2%	-5.5%	-10.5%	-5.5%	-5.0%	-2.4%
	Anacostia #2-9	4.6%	4.0%	-12.7%	3.4%	-2.8%	-1.9%	-11.5%	-11.4%	-10.7%	-10.2%	-4.9%
	Anacostia #2-8	4.3%	3.8%	-14.2%	3.3%	-5.7%	-3.2%	-13.9%	-6.3%	-13.1%	-12.6%	-5.8%
	Kingman Lake-2	4.7%	4.3%	-8.2%	3.9%	-1.2%	1.7%	3.7%	-27.1%	-0.3%	-1.5%	-2.0%
	Anacostia #2-7	5.6%	5.0%	-13.8%	4.4%	-7.5%	-3.3%	-12.2%	-11.2%	-12.6%	-12.2%	-5.8%
	Anacostia #2-6	3.2%	6.6%	-11.5%	5.9%	-7.1%	-0.8%	-9.5%	-17.8%	-10.5%	-9.4%	-5.1%
	Kingman Lake-1	6.7%	6.2%	-11.2%	5.7%	-4.0%	-1.1%	-5.3%	-26.3%	-6.7%	-6.7%	-4.3%
	Anacostia #2-5	2.2%	6.4%	-10.3%	5.8%	-6.4%	-1.3%	-8.1%	-18.4%	-8.7%	-7.5%	-4.6%
	Anacostia #2-4	1.9%	5.9%	-9.7%	5.3%	-4.9%	-2.2%	-7.7%	-12.8%	-7.3%	-6.8%	-3.8%
	Anacostia #2-3	1.0%	5.8%	-9.2%	3.6%	-4.4%	-2.7%	-8.4%	-11.3%	-7.5%	-6.8%	-4.0%
	Anacostia #2-2	0.4%	5.8%	-9.0%	2.3%	-3.9%	-2.7%	-8.5%	-9.9%	-7.3%	-6.6%	-3.9%
	Anacostia #2-1	-0.2%	5.9%	-8.7%	0.6%	-3.4%	-2.5%	-8.5%	-8.5%	-6.9%	-6.3%	-3.9%
	Anacostia #1-2	-0.8%	6.4%	-7.8%	-0.2%	-2.1%	-2.4%	-8.8%	-3.9%	-6.0%	-5.4%	-3.1%
Downstream	Anacostia #1-1	6.3%	6.3%	-1.9%	0.0%	-0.4%	-2.1%	-6.3%	7.0%	-2.7%	-2.4%	0.4%
	Average:	3.2%	5.2%	-8.9%	3.4%	-2.9%	-1.1%	-6.5%	-10.5%	-6.5%	-6.1%	

30-day avg concentration decrease >5%

30-day avg concentration increase >5%

Exceeds TMDL Endpoint

5.1.2.2 Impacts of Climate Change on Natural Attenuation of Bed Sediments

The attenuation timeframes predicted under each of the two climate change scenarios are compared to the attenuation timeframes predicted under the TMDL allocation scenario to illustrate what effects climate change will have on the TMDL allocation scenario and predicted water quality attainment. Table 5.3 shows the length of time needed for each pollutant/pollutant group to achieve the bed sediment target concentrations called for under the TMDL scenario in each VU. Table 5.4 and Table 5.5 show the length of time needed for each pollutant/pollutant group to achieve bed sediment target concentrations in each VU for the 2035 and 2055 climate change scenarios, respectively. Table 5.6 and 5.7 show the difference in the number of years needed to achieve bed sediment targets for the 2035 and 2055 scenarios, respectively. Results for Zinc and PAH 1 are reported as N/A because the TMDL endpoints for those pollutants will be met once the TMDLs are implemented. Therefore, reductions of zinc and PAH 1 concentrations in bed sediment via natural attenuation are not needed to meet the TMDL endpoints for these pollutants. Across the toxic pollutants/pollutant groups, there is a negligible change in the duration of natural attenuation of bed sediments, except in the Kingman Lake and the most downstream VUs in the system. In particular, pollutant concentrations in bed sediment in the lower VU segment of Kingman Lake (Kingman Lake-1) attenuate more rapidly in both the 2035 and 2055 scenarios, whereas the Anacostia 1-1 VUs attenuate more slowly.

Table 5.3 Attenuation Timeline Estimates for Each Pollutant and Tidal Verification Unit for the TMDL Scenario.

		Years needed to attain bed sediment target once TMDL is implemented									
	Verification Unit	Heptachlor epoxide	Chlordane	Dieldrin	DDT	Arsenic	Copper	Zinc	PAH1	PAH2	PAH3
upstream	MD Northwest Branch-1	4	8	8	11	13	8	n/a	n/a	11	11
	MD Tidal Anacostia-1	3	7	6	7	7	5	n/a	n/a	7	7
	Anacostia #2-10	6	10	11	14	12	9	n/a	n/a	12	12
	Anacostia #2-9	6	13	12	16	13	10	n/a	n/a	14	15
	Anacostia #2-8	4	9	9	9	9	7	n/a	n/a	9	9
	Kingman Lake-2	8	17	18	17	25	21	n/a	n/a	23	24
	Anacostia #2-7	8	15	14	17	16	13	n/a	n/a	17	17
	Anacostia #2-6	15	22	26	31	33	23	n/a	n/a	26	27
	Kingman Lake-1	90	117	164	166	204	166	n/a	n/a	199	210
	Anacostia #2-5	12	25	20	25	27	21	n/a	n/a	31	30
	Anacostia #2-4	19	28	38	40	34	29	n/a	n/a	34	32
	Anacostia #2-3	14	20	25	27	31	26	n/a	n/a	32	32
	Anacostia #2-2	21	25	35	39	53	47	n/a	n/a	45	44
	Anacostia #2-1	34	62	59	68	66	55	n/a	n/a	68	69
	Anacostia #1-2	21	34	39	46	46	36	n/a	n/a	49	50
downstream	Anacostia #1-1	33	49	65	59	81	58	n/a	n/a	78	74

* The TMDL does not require bed sediment reductions for zinc and the PAH1 group

Table 5.4 Attenuation Timeline Estimates for Each Pollutant and Tidal Verification Unit for the 2035 Climate Change Scenario.

		Years needed to attain bed sediment target once TMDL is implemented under 2035 climate conditions									
	Verification Unit	Heptachlor epoxide	Chlordane	Dieldrin	DDT	Arsenic	Copper	Zinc	PAH1	PAH2	PAH3
upstream	MD Northwest Branch-1	4	8	7	10	10	7	n/a	n/a	9	9
	MD Tidal Anacostia-1	3	7	7	8	8	6	n/a	n/a	8	8
	Anacostia #2-10	6	9	11	14	12	9	n/a	n/a	12	12
	Anacostia #2-9	6	12	12	15	13	10	n/a	n/a	14	14
	Anacostia #2-8	5	9	9	10	10	7	n/a	n/a	10	10
	Kingman Lake-2	8	17	16	16	23	20	n/a	n/a	22	22
	Anacostia #2-7	7	14	13	16	16	13	n/a	n/a	17	17
	Anacostia #2-6	14	21	23	29	30	21	n/a	n/a	27	24
	Kingman Lake-1	71	94	161	151	182	147	n/a	n/a	179	185
	Anacostia #2-5	11	24	20	24	26	21	n/a	n/a	29	29
	Anacostia #2-4	19	26	38	40	33	30	n/a	n/a	35	31
	Anacostia #2-3	15	24	27	27	31	26	n/a	n/a	32	34
	Anacostia #2-2	21	23	34	38	44	42	n/a	n/a	44	43
	Anacostia #2-1	31	62	57	66	63	51	n/a	n/a	68	65
	Anacostia #1-2	21	35	40	45	47	38	n/a	n/a	52	51
downstream	Anacostia #1-1	34	51	67	60	86	60	n/a	n/a	73	75

* The TMDL does not require bed sediment reductions for zinc and the PAH1 group

Table 5.5 Attenuation Timeline Estimates for Each Pollutant and Tidal Verification Unit for the 2055 Climate Change Scenario.

	Verification Unit	Years needed to attain bed sediment target once TMDL is implemented under 2055 climate conditions									
		Heptachlor epoxide	Chlordane	Dieldrin	DDT	Arsenic	Copper	Zinc	PAH1	PAH2	PAH3
upstream	MD Northwest Branch-1	3	7	6	8	8	6	n/a	n/a	8	8
	MD Tidal Anacostia-1	3	7	7	8	8	6	n/a	n/a	8	8
	Anacostia #2-10	6	9	10	13	12	9	n/a	n/a	12	12
	Anacostia #2-9	6	12	12	14	12	9	n/a	n/a	13	14
	Anacostia #2-8	5	11	11	12	11	8	n/a	n/a	11	11
	Kingman Lake-2	7	16	16	16	23	19	n/a	n/a	21	22
	Anacostia #2-7	7	14	13	16	15	12	n/a	n/a	16	16
	Anacostia #2-6	13	21	23	27	28	20	n/a	n/a	23	22
	Kingman Lake-1	71	101	142	144	168	135	n/a	n/a	166	179
	Anacostia #2-5	12	24	19	23	26	21	n/a	n/a	28	28
	Anacostia #2-4	20	32	40	44	36	31	n/a	n/a	35	33
	Anacostia #2-3	14	23	27	27	32	30	n/a	n/a	33	32
	Anacostia #2-2	21	27	36	39	45	42	n/a	n/a	45	44
	Anacostia #2-1	33	61	59	70	67	52	n/a	n/a	76	67
	Anacostia #1-2	23	38	43	49	51	41	n/a	n/a	55	58
downstream	Anacostia #1-1	37	59	73	61	89	63	n/a	n/a	77	79

* The TMDL does not require bed sediment reductions for zinc and the PAH1 group

Table 5.6 Change in Attenuation Period for the 2035 Climate Change Scenario (years; negative indicates faster attenuation vs. TMDL, positive indicates slower attenuation).

	Verification Unit	2035 Climate Change Scenario: Change in Attenuation Period (years; negative indicates faster attenuation vs. TMDL, positive indicates slower attenuation)									
		Heptachlor epoxide	Chlordane	Dieldrin	DDT	Arsenic	Copper	Zinc	PAH1	PAH2	PAH3
upstream	MD Northwest Branch-1	0	0	-1	-1	-3	-1	n/a	n/a	-2	-2
	MD Tidal Anacostia-1	0	0	1	1	1	1	n/a	n/a	1	1
	Anacostia #2-10	0	-1	0	0	0	0	n/a	n/a	0	0
	Anacostia #2-9	0	-1	0	-1	0	0	n/a	n/a	0	-1
	Anacostia #2-8	1	0	0	1	1	0	n/a	n/a	1	1
	Kingman Lake-2	0	0	-2	-1	-2	-1	n/a	n/a	-1	-2
	Anacostia #2-7	-1	-1	-1	-1	0	0	n/a	n/a	0	0
	Anacostia #2-6	-1	-1	-3	-2	-3	-2	n/a	n/a	1	-3
	Kingman Lake-1	-19	-23	-3	-15	-22	-19	n/a	n/a	-20	-25
	Anacostia #2-5	-1	-1	0	-1	-1	0	n/a	n/a	-2	-1
	Anacostia #2-4	0	-2	0	0	-1	1	n/a	n/a	1	-1
	Anacostia #2-3	1	4	2	0	0	0	n/a	n/a	0	2
	Anacostia #2-2	0	-2	-1	-1	-9	-5	n/a	n/a	-1	-1
	Anacostia #2-1	-3	0	-2	-2	-3	-4	n/a	n/a	0	-4
	Anacostia #1-2	0	1	1	-1	1	2	n/a	n/a	3	1
downstream	Anacostia #1-1	1	2	2	1	5	2	n/a	n/a	-5	1

* The TMDL does not require bed sediment reductions for zinc and the PAH1 group

> 5 Additional years to achieve bed sediment target

> 5 Fewer years to achieve bed sediment target

> 10 Fewer years to achieve bed sediment target

> 20 Fewer years to achieve bed sediment target

Table 5.7 Change in Attenuation Period for the 2055 Climate Change Scenario (years; negative indicates faster attenuation vs. TMDL, positive indicates slower attenuation).

		2055 Climate Change Scenario: Change in Attenuation Period (years; negative indicates faster attenuation vs. TMDL, positive indicates slower attenuation)									
	Verification Unit	Heptachlor epoxide	Chlordane	Dieldrin	DDT	Arsenic	Copper	Zinc	PAH1	PAH2	PAH3
upstream	MD Northwest Branch-1	-1	-1	-2	-3	-5	-2	n/a	n/a	-3	-3
	MD Tidal Anacostia-1	0	0	1	1	1	1	n/a	n/a	1	1
	Anacostia #2-10	0	-1	-1	-1	0	0	n/a	n/a	0	0
	Anacostia #2-9	0	-1	0	-2	-1	-1	n/a	n/a	-1	-1
	Anacostia #2-8	1	2	2	3	2	1	n/a	n/a	2	2
	Kingman Lake-2	-1	-1	-2	-1	-2	-2	n/a	n/a	-2	-2
	Anacostia #2-7	-1	-1	-1	-1	-1	-1	n/a	n/a	-1	-1
	Anacostia #2-6	-2	-1	-3	-4	-5	-3	n/a	n/a	-3	-5
	Kingman Lake-1	-19	-16	-22	-22	-36	-31	n/a	n/a	-33	-31
	Anacostia #2-5	0	-1	-1	-2	-1	0	n/a	n/a	-3	-2
	Anacostia #2-4	1	4	2	4	2	2	n/a	n/a	1	1
	Anacostia #2-3	0	3	2	0	1	4	n/a	n/a	1	0
	Anacostia #2-2	0	2	1	0	-8	-5	n/a	n/a	0	0
	Anacostia #2-1	-1	-1	0	2	1	-3	n/a	n/a	8	-2
	Anacostia #1-2	2	4	4	3	5	5	n/a	n/a	6	8
downstream	Anacostia #1-1	4	10	8	2	8	5	n/a	n/a	-1	5

* The TMDL does not require bed sediment reductions for zinc and the PAH1 group

> 5 Additional years to achieve bed sediment target

> 5 Fewer years to achieve bed sediment target

> 10 Fewer years to achieve bed sediment target

> 20 Fewer years to achieve bed sediment target

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APPENDIX C: RESPONSE TO PUBLIC COMMENT

Comment Response Document
Regarding the Total Maximum Daily Loads for Organics and Metals in the Anacostia River Watershed, its Tributaries, and Kingman Lake, The District of Columbia

A. Introduction

The District of Columbia Department of Energy and Environment (DOEE) has received public comments on the proposed Total Maximum Daily Loads (TMDLs) for Organics and Metals in the Anacostia River, its tributaries, and Kingman Lake, District of Columbia (the District). Notice of the initial publication of the TMDLS was provided on July 9, 2021 (68 DC Register 6840-41) with a comment period through August 13, 2021. DOEE received four sets of written comments[3]. After consideration of the public comments received, DOEE determined that certain comments warranted additional analysis and/or revisions to the draft TMDLs. DOEE published revised draft TMDLs for public review September 8, 2023 (70 DC Register 12484-85) with a comment period through October 23, 2023.

Below are two tables listing the commenters, their affiliation, the date comments were submitted, and the numbered references to the comments submitted for both public comment periods. In the pages that follow, comments are summarized and listed with DOEE's responses.

Table 33 List of Commenters from the 2021 Public Comment Period

Author	Affiliation	Date	Comment Number
Hallie Templeton	Friends of the Earth (38 members)	August 4, 2021	1
Erin B. Castelli	Anacostia Watershed Society	August 6, 2021	2 through 14
Anna Sewell, Gonzalo Rodriguez	Earthjustice on behalf of Anacostia Riverkeeper, Friends of the Earth, and Potomac Riverkeeper	August 6, 2021	15 through 79

Table 34 List of Commenters from the 2023 Public Comment Period

Author	Affiliation	Date	Comment Number
Moussa Wone	D.C. Water	October 23, 2023	80 through 91

[3] When the draft TMDLs were made available for public notice and comment in 2021, they included draft TMDLs for heptachlor epoxide developed by the Maryland Department of the Environment (MDE) for certain Maryland waters (Northeast Branch Anacostia River, MD Tidal Anacostia River). MDE has determined to develop those MD TMDLs separately from this effort and did not seek additional public comment on the MD TMDLs during the 2023 public comment period. Because the MD TMDLs are being developed separately, comments on the MDE TMDLs and responses thereto are not included in this Comment Response Document.

Anna Sewell	Earthjustice on behalf of Anacostia Riverkeeper, Friends of the Earth, and Potomac Riverkeeper	October 23, 2023	92 through 144

Because many comments focus on similar themes, are overlapping, and/or are repetitive, DOEE is providing the following Response Essays that respond to more than one comment. Individual comments are cross-referenced to these Response Essays. Where individual comments raise a specific point not fully covered in one of the Response Essays, a specific, individual response is provided.

B. Response Essays

Response Essay #1: Several commenters stated that the Anacostia River has long suffered pollution and must be restored and safeguarded from further pollution, and that the 2023 draft TMDLs should be revised before being finalized.

DOEE is undertaking many activities to ensure water quality and to safeguard the overall health of the Anacostia River watershed. These TMDLs specifically address the levels of certain metals, organochlorine pesticides, and polycyclic aromatic hydrocarbons that cause pollution in District waters. The District's Water Quality Standards, which are designed to protect water quality, prescribe numeric criteria for the above-mentioned pollutants and those criteria are used as the TMDL endpoints. See also Response Essay #10.

The pollution diet or load reductions prescribed in these TMDLs, which range up to 100 percent, are set at levels necessary to attain and maintain water quality standards in the Anacostia River watershed. The overall watershed allocations for dieldrin, PAH 2, and PAH 3 require overall reductions of 100, 99.98, and 100 percent, respectively. In addition, the allocations for arsenic, chlordane, DDT, and heptachlor epoxide require overall reductions of 96.63, 98.28, 98.89, and 97.5 percent, respectively. In addition, many sources of these pollutants were given allocations that require reductions of greater than 99 percent. For example, heptachlor epoxide annual allocations for the MS4, Contaminated Sites, and CSS each called for greater than 99 percent reductions. Please see Tables 6-13 through 6-22 for additional examples of sources, particularly regulated sources, with prescribed allocations that require greater than 99 percent reductions for various TMDL pollutants.

DOEE has carefully considered the public comments received during both the 2021 and 2023 comment periods. DOEE believes these TMDLs are protective of water quality in the Anacostia River watershed and meet all legal requirements.

Response Essay #2: Several commenters questioned how the TMDLs treat contributions from the Contaminated Sites.

With the exception of the Washington Navy Yard (WNY) and PEPCO, the TMDLs allocate load allocations to the Contaminated Sites in the District identified at Table 3-1 on page 29 of the TMDL (hereafter "Contaminated Sites") because conveyance of the TMDL pollutants from these sites generally is diffuse and is not regulated by a National Pollutant Discharge Elimination System (NPDES) permit.[4] Both PEPCO and the WNY were considered "dual sources," i.e., they are modeled as Contaminated Sites with respect to diffuse, unregulated stormwater that flows from these sources and also as individually permitted point sources for discharges under an NPDES permit. Allocations to PEPCO and the WNY are expressed as wasteload allocations, and those wasteload allocations cover both the diffuse, land-based loads and the loads attributed to their NPDES discharges.

Response Essay #3: Several commenters questioned whether it is appropriate for purposes of developing the model and the TMDLs to assume that point sources for which there is no available pollutant-specific data would discharge TMDL pollutants at concentrations equal to water quality criteria, and several commenters asserted that WLAs for these sources should not be set based on discharge concentrations equal to water quality criteria.

DOEE received many comments regarding the model's assumption that discharges from point sources for which there were no pollutant-specific data would be at concentrations consistent with the District's applicable numeric water quality criteria. It is important to understand that this assumption is limited to NPDES discharges from only four (4) individually permitted point sources that are not expected to be significant contributors of the TMDL pollutants. TMDL modeling shows that the majority of toxic pollutant loadings originate from stormwater sources such as the MS4 and CSS and not these four (4) individually permitted point sources.

To be more specific, there are four (4) categories of point sources represented in the model: the MS4, the CSS, sources covered by the MSGP, and point sources that are individually permitted. Of these four categories, discharge concentrations equal to water quality criteria are assumed in connection only four (4) individually permitted point sources. (For the other three (3) categories, see Section 3.2.2 of the TMDL Report discussing how discharges from the MS4, CSS and MSGP were represented in the model.)

The modeling assumption at issue was limited to the four individually NPDES permitted point sources in the District: the Washington Navy Yard (WNY) (DC0000141); PEPCO (DC0000094) (except for copper and zinc, for which DMR data was used), Super Concrete (DC0000175), and discharges from D.C. Water's Northeast Boundary Swirl Concentrator through Outfall 019 of D.C. Water's NPDES Permit (DC0021199). Other than copper and zinc from PEPCO, the process wastewater and regulated stormwater from these facilities are not expected to contain the pollutants covered by this TMDL based on effluent characterization in their permit applications. Based on information available regarding these discharges (including discharge characterization information in their permit applications) and the relatively small percentage of flows contributed by the discharges from these sources, there is no reason to believe they are contributing significant levels of the TMDL pollutants. Furthermore, the assumption that process wastewater and regulated stormwater discharged from these facilities contained TMDL pollutants at concentrations equal to the District's water quality criteria was made in lieu of assuming that the discharges of TMDL pollutants from these facilities was zero.

Also, the WNY and PEPCO are also Contaminated Sites and are represented in the model as dual sources. While the regulated stormwater discharges from the WNY and PEPCO are treated as

[4] If a point source discharge properly regulated under the NPDES program is identified within these areas, nothing in this TMDL prevents that point source discharge from being regulated under CWA Section 402 and assigned permit limits consistent with CWA 301(b)(1)(C) and the assumptions and requirements of these TMDLs, including the total contributions from each contaminated site.

discharging at concentrations equal to water quality criteria (or level of detection in the case of PAH 1), diffuse unregulated stormwater runoff from those sites, is not assumed to be entering the water at concentrations equal to water quality criteria, but instead was represented in the model based upon associated runoff and loading characteristics, and thus included in the wasteload allocation for these sites.

While source-specific data may not have been available from these individually permitted facilities, sufficient precipitation and instream data was collected to inform and calibrate the linked models to an acceptable degree. Calibration metrics focused on ensuring that the model showed reasonable agreement between observed and simulated pollutant concentrations in both the Anacostia River and its tributaries. Model results were visually and statistically compared with observed data collected during the 2014-2017 time period. Model calibration confirms that the model appropriately represents and accurately simulates observed instream water quality.

The regulated process wastewater and stormwater discharges from the four individually permitted facilities were assigned WLAs based on concentrations at water quality criteria expressed as a concentration. Concerns that setting these wasteload allocations at concentrations equal to water quality criteria either over-allocated or under-allocated loads to these four facilities are unwarranted because if these sources were discharging at concentrations greater than water quality criteria, the wasteload allocations represent a reduction. If these facilities' baseline discharges were at concentrations less than water quality criteria, then allocations to them based upon concentrations at water quality criteria are conservative and represent an additional margin of safety.

Response Essay #4: Several commenters pointed out that the model simulation period (2014-2017) does not account for on-the-ground changes due to completion and operation of the Anacostia River Tunnel System since March 2018.

As set forth in the TMDL Report, the model simulation period does not capture certain changes to the combined sewer system (CSS) that occurred beginning in 2018. Because of this, commenters state that the TMDL Report incorrectly characterizes the discharges from Outfall 019 and 019a. DOEE acknowledges the commenter's more accurate description.

The model simulation period predates completion of construction and operation of the Anacostia River Tunnel system. The tunnel system (which includes the Anacostia River Tunnel and surface facilities to divert the combined sewer overflows to the tunnel at various locations[5]) connects with the Blue Plains Tunnel and delivers captured combined sewer overflows (CSOs) to the Blue Plains Advanced Wastewater Treatment Plant for treatment and ultimately discharge to the Potomac River. The tunnel system mitigates CSOs previously discharged to the Anacostia River from the CSS. Phrased simply, operation of the tunnel system is expected to reduce the number, frequency, and volume of CSOs from the CSS to the Anacostia River and its tributaries. The reduction in CSOs due to the operation of the Anacostia River Tunnel system is not captured by the model simulation period and can be considered part of the margin of safety. Furthermore, these tunnel systems add further reasonable assurance that the prescribed TMDL allocations can be achieved.

[5] It should be noted that as of September 2023 the Northeast Boundary Tunnel was completed and put into service.

In addition, during the model simulation period, Outfall 019 served as the discharge location from the Northeast Boundary Swirl Concentrator Facility[6] to the Anacostia River. After the model simulation period, in March 2018, the Northeast Boundary Swirl Concentrator Facility was permanently taken out of service, and Outfall 019 now serves as a CSO discharge point. The commenter also pointed out that new CSO 019a is co-located with Outfall 019. Both 019 and 019a remain active CSOs and may discharge when the capacity of the Anacostia River Tunnel System is reached. The TMDLs assign a single wasteload allocation to the CSS; however, the TMDLs continue to assign a separate wasteload allocation to Outfall 019.

Response Essay #5: Comments related to the assignment of a load allocations as the boundary condition with Maryland.

The TMDL Report at page 27 states: "As the Anacostia River is an interjurisdictional water, it is important to capture the loads from each jurisdiction. For each pollutant in the District, the upstream Maryland segments (Northeast Branch, Northwest Branch, MD Tidal Anacostia) and the tributaries to the Anacostia River that originate in Maryland (Nash Run, Watts Branch, and Lower Beaverdam Creek) are included as upstream loads to the District." The Report (at pages 28-29 in Section 3.1.1) then states: "This TMDL Report presents this upstream loading from Maryland for all ten toxic pollutants. These upstream loads are presented as a single value, representing the total load from the upstream subwatershed; however, it could include both point and nonpoint sources. For the purposes of this analysis, the load is treated as a single nonpoint source load (See Section 3.3.5 of the TMDL Modeling Report for more information)" (Tetra Tech, 2023b).

The TMDLs set an upstream boundary condition that appropriately accounts for loads reaching District waters from Maryland and represents an aggregate of all upstream nonpoint and point source loadings. The Maryland upstream load allocation has been established at a level to meet downstream water quality within the District portion of the Anacostia River mainstem. By setting a boundary condition that is designed to achieve water quality standards in the District's waters, the TMDLs do not determine that the entire load from Maryland is a nonpoint source load. Rather, this load allocation represents an aggregate load to point and nonpoint sources within Maryland and appropriately allows Maryland, rather than the District, to allocate loads among Maryland point and nonpoint sources.[7] Consistent with CWA Section 402(b)(3) and (5), Maryland's permitting regulations require notification and an opportunity to comment to the District when Maryland authorizes a discharge that could affect the District's waters. *See* COMAR 26.08.04.01-2.B(3)(a).

Response Essay #6: Several commenters assert that bed sediment should receive a wasteload or load allocation or otherwise question how reduction of pollutants contributed by bed sediment will be achieved. Some of these commenters urge that a load allocation be assigned to bed sediment because the commenters believe that providing a load allocation will create a regulatory requirement for bed

[6] The TMDL Report referred to the source as "Blue Plains" because that is the term associated with the relevant NPDES Permit. In light of public comment, this response clarifies that Outfall 019 described in the permit served as the discharge location from the Northeast Boundary Swirl Concentrator Facility.

[7] There is one exception. While the load from Super Concrete (DC0000175) enters the Anacostia River from Maryland, a separate WLA for Super Concrete is carved out of the aggregate upstream boundary condition load allocation for Maryland sources. The reason is the unique circumstance of Super Concrete. The discharge from DC0000175 enters an unnamed tributary in DC which then flows eastward across the DC/MD boundary and ultimately drains into the MD Northwest Branch.

sediment remediation. In addition, multiple commenters assert that natural attenuation should not be an assumption of the TMDLs.

The water quality model developed for these TMDLs simulates conditions within the water column and sediment as a single system, therefore, exchanges between the sediment and water column are considered an internal load within the system rather than an external, land-based source contributing a load to the system. Because elevated toxins in fish tissue are a function of both water column and bottom sediment concentrations, modeling both media as part of one, interconnected system is appropriate. For these reasons, bed sediment is not considered a nonpoint source or assigned a load allocation in these TMDLs.

DOEE agrees that, for all TMDL pollutants except zinc and PAH 1, reductions in flux between the water column and the bed sediment will be needed to attain the TMDL endpoints. Under the TMDL scenario, reductions from all land-based sources (point and nonpoint) are simulated. After that, the concentration of each TMDL pollutant in the bed sediment necessary to achieve ambient water quality concentrations consistent with each TMDL endpoint is identified. The model then simulates the length of time it will take to achieve the bed sediment concentration that will allow the water column to achieve the ambient TMDL endpoints following full implementation of all TMDL allocations to land-based sources. See Section 5.4 of the TMDL Report.

DOEE expects that reductions in flux between the water column and bed sediment will occur following, and partly as a result of, achievement of the TMDL allocations. Model simulation demonstrates that, after the TMDL allocations are achieved, natural attenuation ultimately will result in achieving water quality standards. The process of natural attenuation will only reasonably occur as reductions in pollutant concentrations are made throughout the watershed, resulting in the influx of cleaner water and sediment into the system and the burial or transport out of the system of toxic contaminated water and sediment. Instream processes such as burial of contaminated sediments with newer, less contaminated material; scour and export of sediments during periods of high stream flow; and natural degradation will contribute to the decline of these pollutants over time. Refer to Section 5.4 of the TMDL Report for more detail.

For all TMDL pollutants except zinc and PAH 1[8], natural attenuation is incorporated as a component of the TMDL scenario, i.e., the means of achieving the bed sediment reductions that will result in attainment of the TMDL endpoints (following achievement of the TMDL allocations), and is an assumption of the TMDLs. For a discussion of the time period to attain ambient water quality concentrations consistent with water quality criteria, see Response Essay #7.

Some comments discussed the potential role of the ARSP or other bed sediment remediation efforts in achieving the TMDL endpoints. Sediment remediation, including activities taken in connection with the ARSP, is not incorporated into the TMDL scenario and is not an assumption of the TMDLs. The ARSP is a contaminated site project, the scope and timing of which are not part of these TMDLs.[9] The ARSP is a

[8] The zinc and PAH 1 TMDL endpoints will be attained once the TMDL allocations to all land-based sources are implemented and attainment is not reliant on the process of natural attenuation.

[9] PCBs are the focus of the ARSP; however, the ARSP Remedial Investigation (RI) identified five contaminants of concern including PCBs, chlordane, dioxin like PCBs, dioxin toxic equivalent, and benzo(a)pyrene. In 2020, the ARSP Interim Record of Decision (ROD) was published, which identifies the early actions areas or “hot spots” in the

separate project that is occurring in parallel with TMDL development, but that is on a separate timeline. The ARSP primarily focuses on remediation of PCB contamination. That said, remediation of PCB-contaminated sediment is expected to also reduce other sediment-bound pollutants, including the TMDL pollutants that are co-located. It is reasonable, therefore, to conclude that the remediation of contaminated sediment would decrease the time it will take for water quality to approach the TMDL endpoints. Nothing in these TMDLs precludes the use of any sediment pollutant remediation efforts, including the ARSP, as tools to achieve TMDL endpoints. Consequently, these TMDLs are not inconsistent with sediment remediation efforts of the ARSP.

Some commenters state that a load allocation should be assigned to the bed sediment in order to require bed sediment remediation or removal through the ARSP or other programs. These commenters misunderstand how TMDLs work. TMDLs are informational tools that inform water quality-based decision-making. Sometimes described as pollution “diets,” TMDLs inform development and planning of pollution controls. While TMDLs must be set at a level necessary to attain water quality standards, TMDLs are not self-executing and do not require or direct implementation of any specific remedial action.[10] In other words, assigning a load allocation to the bed sediment rather than treating the bed sediment as part of the internal system would not require or make it any more likely that sediment remediation would occur as a result of the ARSP or any other program. These TMDLs are established at a level necessary to implement water quality standards regardless of whether the ARSP is implemented. See also Response Essay #7.

Response Essay #7: Several commenters asserted that projected timeframes to achieve water quality standards are too long.

The District has allocated numerous resources to plan and implement many actions to help achieve the applicable water quality standards. While the CWA directs that TMDLs be established at a level necessary to implement applicable water quality standards, the CWA and regulations do not specify any particular time period to achieve water quality standards. The time required to achieve water quality standards necessarily will depend upon such factors as the nature of the pollutant, the applicable water quality standards, the nature of the sources, and the nature of the receiving waters.

As explained in Section 5.4 of the TMDL Report and in Response Essay #6, natural attenuation was incorporated in the TMDL scenario as a TMDL assumption. A methodology was developed and executed to demonstrate that the TMDL endpoints will be met after the TMDL scenario is implemented through the process of natural attenuation.

In the case of these TMDLs, much of the impairment is due to the legacy presence of the TMDL pollutants on land and in the river system rather than through generation and discharge of these pollutants due to present, active operations. The legacy nature of most of the impairments, combined with the nature of the TMDL pollutants, means that the return to water quality standards necessarily

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Anacostia River watershed where PCB contamination is highest and requires remediation. Overall, an area of approximately 77 acres will be remediated through a variety of remedial activities. The remediation at the 11 early action areas will also beneficially reduce other pollutants (e.g., metals, organochlorine pesticides, and PAHs) that concurrently exist in the PCB-contaminated sediment.

[10] 40 CFR 122.44(d)(1)(B)(vii) does require that water quality-based effluent limitations in NPDES permits be consistent with the assumptions and requirements of any available wasteload allocation established for the discharge through a TMDL.

will take a long period of time. Metals (copper, zinc) and metalloids (arsenic) are likely to accumulate in sediment. Organochlorine pesticides and pesticide degradation products (chlordane, DDT and metabolites, dieldrin, heptachlor epoxide) persist in the environment even though their use has been banned or substantially limited for decades. They have slow degradation rates in soils and sediments, very limited solubility in water, strong adherence to soils and sediments, and a strong tendency to bioaccumulate. PAHs share similar characteristics. As a result, it can be expected that it will take a lengthy period of time for the Anacostia River, its tributaries, and Kingman Lake to return to conditions by which levels of the TMDL pollutants meet water quality standards.

Some commenters stated that the efficacy of best management practices (BMPs) and other efforts to prevent the TMDL pollutants from reaching the river should be modeled. However, simulation of specific BMPs or management program-induced reductions is not a requirement for TMDLs and is beyond the scope of this project.

The objective of the TMDL is to establish toxic pollutant loads for an impaired water can receive at levels necessary to achieve the applicable water quality standards. TMDLs do not direct or require implementation of any specific set of actions or selection of controls, nor do they specify the rate at which implementation must occur. Given the nature of the pollutants, the way in which the pollutants enter the water, and the nature of the impairments, the TMDL allocations are set at levels necessary to implement water quality standards.

Response Essay #8: Commenters asserted that the Reasonable Assurance established in the TMDL, including but not limited to, sediment remediation and inadequate monitoring and lack of an implementation or adaptive management plan, is inadequate.

The concept of "reasonable assurance" derives from the requirement in CWA Section 303(d) that a TMDL be "established at a level necessary to implement the applicable water quality standard." Documenting adequate reasonable assurance increases the probability that regulatory and voluntary mechanisms will be applied that reasonably assure that the pollution reduction levels specified in the TMDL are achieved and, therefore, applicable water quality standards are attained.

Nonpoint source loads are not regulated by the CWA. Nothing in the CWA or its implementing regulations demands that nonpoint source loads be achieved through state or federal permitting or other regulatory mechanisms. Longstanding EPA guidance states that reasonable assurance that nonpoint source loads will be achieved may be through non-regulatory, regulatory, or incentive-based means established by applicable laws and programs.

Where a TMDL is developed for waters impaired by both point and nonpoint sources, reasonable assurance that the TMDL's load allocations will be achieved may include whether practices capable of reducing the specified pollutant load: (1) exist; (2) are technically feasible at a level required to meet allocations; and (3) are likely to be implemented. Reasonable assurance need not be based upon a single practice or program, but instead may be based on consideration of a combination of practices and outcomes.

Some commenters asserted that there is insufficient assurance that nonpoint source loads will be reduced and therefore further reductions must be taken from the point sources. However, these commenters appear to misconstrue the load and wasteload allocations in the TMDLs. The only nonpoint sources receiving load allocations are the Contaminated Sites (see Response Essay #2) and the upstream boundary condition with Maryland (see Response Essay #5). The remaining allocations are wasteload allocations to the District MS4, the CSS, the facilities covered by the MSGP, and to four individually permitted facilities. Section 9 of the TMDL Report describes practices for assuring that the wasteload allocations to the District's MS4[11] and D.C. Water's CSS will be achieved. Section 9 also describes ongoing efforts to address contributions of the TMDL pollutants from the Contaminated Sites through remediation and other efforts, including the ARSP. See Response Essays #6 and #9 for further discussion.

Other commenters asserted that efforts undertaken as a result of the 2014 Chesapeake Bay Watershed Agreement should not be included as Reasonable Assurance. DOEE disagrees. The 2014 agreement includes goals and outcomes for mitigation and ultimate elimination of toxic contaminants in the Chesapeake Bay watershed, and efforts to reach these goals and outcomes pursuant to the 2014 agreement are appropriately discussed as part of Reasonable Assurance. DOEE participates in the Toxic Contaminants Workgroup established by the Agreement to accomplish Agreement goals and outcomes. A research outcome of the workgroup is to increase understanding of the impacts and mitigation options for toxic contaminants. These collective efforts will further the understanding of water quality and potential solutions to the presence of toxic pollutants in the Anacostia River watershed. The fact that the Chesapeake Bay Agreement efforts to eliminate toxic contaminants have not yet fully succeeded is not a reason to exclude those efforts from the mix of programs and practices that, when combined with other such programs and practices, provide Reasonable Assurance.

Some commenters discussed the potential role of the ARSP or other bed sediment remediation efforts in the context of Reasonable Assurance. Sediment remediation, including activities taken in connection with the ARSP, is not incorporated into the TMDL scenario and is not an assumption of the TMDLs. The ARSP is a contaminated site project whose scope and timing are outside these TMDLs.[12] The ARSP is a separate project focused on remediation that is occurring in parallel with TMDL development, but otherwise on a separate timeline. The ARSP focuses on PCB contamination. That said, remediation of PCB-contaminated sediment likely will also have the secondary benefit of reducing other sediment-bound pollutants, including the TMDL pollutants that are co-located. It is reasonable, therefore, to conclude that the remediation of contaminated sediment would decrease the time it will take for water quality to approach the TMDL endpoints.

Some commenters assert that these TMDLs must be accompanied by an implementation plan. While EPA encourages development of implementation plans concurrent with TMDLs as a best practice, concurrent development of implementation plans is not required by the CWA or its implementing

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[11] For example, through the permit's requirement that the District "shall continue to update the Consolidated TMDL Implementation Plan modeling tool and associated databases, which shall be used in the development of revised plans, schedules, or strategies. The modeling tool and/or associated databases shall also be used to provide consistent tracking of progress against milestones and benchmarks. Milestone and benchmark progress shall be included in each year's Annual Report for effective utilization by multiple audiences, including the public."

[12] PCBs are the focus of the ARSP; however, the ARSP Remedial Investigation (RI) identified five contaminants of concern including PCBs, chlordane, dioxin like PCBs, dioxin toxic equivalent, and benzo(a)pyrene. In 2020, the ARSP Interim Record of Decision (ROD) was published, which identifies the early actions areas or "hot spots" in the Anacostia River watershed where PCB contamination is highest and requires remediation. Overall, an area of approximately 77 acres will be remediated through a variety of remedial activities. The remediation at the 11 early action areas will also beneficially reduce other pollutants (e.g., metals, organochlorine pesticides, and PAHs) that concurrently exist in the PCB-contaminated sediment.

regulations. TMDLs are informational tools intended to inform future watershed management decisions. Reasonable Assurance does not require that an implementation plan be developed, but instead provides sufficient information on the feasibility and practicability of nonpoint source reductions to inform allocation decisions. The objective of the TMDL is to establish toxic loads necessary to attain and maintain applicable WQS.

Some commenters asserted that specific post-TMDL monitoring plans must be included or faulted DOEE's plans for further monitoring. DOEE agrees that, while not required by statute or regulation, it is important to engage in post-TMDL monitoring in order to evaluate progress toward attaining TMDL endpoints and to assess the need to refine or improve control measures. As part of that monitoring effort, it is appropriate for DOEE to leverage its own ongoing fish tissue and other monitoring programs along with monitoring conducted pursuant to the ARSP and conducted by third party groups.

Some commenters stated that the efficacy of BMPs and other efforts to prevent the TMDL pollutants from reaching the river should be modeled. However, simulation of specific BMPs or management program induced reductions is not a requirement for establishing TMDLs.

Response Essay #9: Commenters asserted that greater reductions should be taken from point sources or that the TMDLs are overly reliant on nonpoint source reductions.

A number of commenters asserted that the TMDLs are overly reliant on load allocations representing reductions from nonpoint sources and that reductions to the point sources must be "maximized." Many of these comments appear to misunderstand the TMDLs. The only load allocations to nonpoint sources in the TMDLs are those assigned to the Contaminated Sites and to the boundary condition with Maryland. See Response Essays # 2 and # 5. The load allocations for the Contaminated Sites are set out in Section 6.5 of the TMDL Report. All other allocations, including those associated with stormwater runoff, are wasteload allocations assigned to the District's MS4, the CSS, facilities covered by the MSGP, and individually permitted facilities. PEPCO and the WNY are "dual sources," i.e., both Contaminated Sites and individually permitted point sources. Allocations to PEPCO and the WNY, including those for stormwater runoff from those sites, are expressed as wasteload allocations.

There are no load allocations in the Hickey Run, Kingman Lake, Fort Chaplin Run, Fort Davis Tributary, Fort Stanton Tributary, Popes Branch and Texas Avenue Tributary segments because there are no Contaminated Sites within those subwatersheds and all stormwater runoff in these areas is captured by the District's MS4 system, which is given wasteload allocations. Accordingly, for those segments, the TMDLs already shift all reductions to the point sources (i.e., the MS4) and no reductions are called for from nonpoint sources because there are no nonpoint sources within those subwatersheds.

Stormwater runoff within the watershed is captured by the MS4, the CSS, or is from facilities covered by the MSGP, all of which received wasteload allocations. Section 3.2.2 of the TMDL Report describes how loads from the MS4, CSS, and facilities covered by the MSGP associated with stormwater runoff were calculated. Notably, the TMDL scenarios were set to maximize point source reductions (including NPDES permitted stormwater point sources) in each subwatershed before nonpoint source reductions were prescribed. TMDL allocations were calculated using a top-down subwatershed approach within the model. Sources within each subwatershed were reduced until the TMDL endpoints were met within that subwatershed and point source reductions were maximized to the greatest extent practicable first before prescribing reductions to nonpoint sources.

Response Essay #10: Commenters asserted that the TMDLs are not set at a level to achieve all applicable water quality standards, including narrative water quality criteria and all designated uses.

DOEE has appropriately considered all relevant designated uses and water quality criteria (including the District's narrative water quality criteria) and determined that the TMDLs are established "at a level necessary to implement the *applicable* water quality standards." 33 USC 1313(d)(1)(C) (emphasis added).

Water quality standards include designated uses for each waterbody, water quality criteria to protect the uses, and antidegradation requirements. The commenters focused on whether the TMDLs are established at a level necessary to implement designated uses and applicable water quality criteria.

The Anacostia River is designated for all of the uses identified in the District's water quality standards (referred to in the District's regulations as Class A, B, C, D, and E), while its tributaries are designated for uses Class A, B, C, and D. 21 DCMR. 1101.1. The TMDL endpoints for each pollutant addressed in the TMDL are the District's corresponding EPA-approved numeric water quality criteria that support the Class C (protection and propagation of aquatic life) and Class D (human health related to consumption of fish and shellfish) designated uses. The District's numeric water quality criteria for the TMDL pollutants are based upon EPA's Clean Water Act section 304(a) recommended criteria for those pollutants. EPA's recommended human health criteria also consider exposure (i.e., incidental ingestion) resulting from recreation in and on the water (Class A and Class B). Criteria that protect human health related to the ingestion of aquatic organisms (i.e., Class D) are generally expected to protect human health from less direct exposures (i.e., Class A and Class B).[13] The TMDL pollutants do not affect navigation (Class E).

The District's water quality standards contain more than one numeric criterion for each of the TMDL pollutants. For example, for the organochlorine pesticides, the District's water quality standards include a criteria maximum concentration (CMC) and a criteria continuous concentration (CCC) to protect aquatic life (i.e., Class C) from acute and chronic exposures, respectively, and a 30-day average concentration for the protection of human health related to the consumption of fish and shellfish (i.e., Class D). When that is the case, the TMDL endpoints are set at the most stringent numeric criterion for each TMDL pollutant or pollutant group. See Sections 1.4 and 1.5 of the TMDL Report.

DDD, DDE, and DDT were grouped together, and the most stringent criterion of the three was used as the TMDL endpoint. Additionally, PAHs were divided into three groups based on benzene ring structure and the most stringent criterion in each group was used as the TMDL endpoint. The PAH 1 group represents PAHs with two and three rings, the PAH 2 group represents PAHs with four rings, and the PAH 3 group represents PAHs with five and six rings.

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[13] EPA has considered whether there are cases for which water quality criteria for the protection of human health based only on fish ingestion (or only criteria for the protection of aquatic life) may not adequately protect recreational users from health effects resulting from incidental water ingestion. EPA reviewed information that provided estimates of incidental water ingestion rates averaged over time. EPA generally believes that the averaged amount is negligible and will not have any impact on the chemical criteria values that represent both drinking water and fish ingestion. A lack of impact on the criteria values is also likely true for chemical criteria based on fish consumption only, unless the chemical exhibits no bioaccumulation potential. *See* EPA, Methodology for Deriving Ambient Water Quality Criteria for Protection of Human Health – Revised Methodology (2000) (available at https://www.epa.gov/wqc/human-health-water-quality-criteria-and-methods-toxics#methodology).

A number of commenters asserted that the TMDLs are not established at levels to achieve the District's narrative water quality criteria, which are set forth at 21 DCMR § 1104.1:

> The surface waters of the District shall be free from substances in amounts or combinations that do any one of the following:
>
> (a) Settle to form objectionable deposits;
> (b) Float as debris, scum, oil, or other matter to create a nuisance;
> (c) Produce objectionable odor, color, taste, or turbidity;
> (d) Cause injury to, are toxic to, or produce adverse physiological or behavioral changes in humans, plants, or animals;
> (e) Produce undesirable or nuisance aquatic life or result in the dominance of nuisance species; or
> (f) Impair the biological community that naturally occurs in the waters or depends upon the waters for its survival and propagation.

Of these, only §§ 1104.1(d) and (f) are relevant or "applicable" to the TMDL pollutants. The narrative criteria at §§ 1104.1(a), (b), (c) and (e) are not relevant because, while the TMDL pollutants do bind to sediment, the TMDL pollutants themselves do not settle to form objectionable deposits.[14] The TMDL pollutants also do not: float as debris, scum, oil, or other matter; produce objectionable odor, color, taste, or turbidity at environmentally relevant levels; or produce undesirable or nuisance aquatic life or result in the dominance of nuisance species. DOEE also considered the narrative criteria at §§ 1104.3 through 1104.7, which clearly do not relate to toxic pollutants and instead focus on specific topics such as aesthetic properties, untreated sewage and litter, the burial or obstruction of objects, concentrations of chlorophyll *a*/algae, or unmarked submerged or partially submerged man-made objects.

The TMDLs here are established at levels to achieve the narrative water quality criteria set forth at §§ 1104.1(d) and (f). As a general matter, narrative water quality criteria are intended to supplement, not supersede, numeric criteria or to establish water quality conditions for parameters for which no numeric criteria have been established. 40 CFR § 131.11(b)(2). Regardless, and to the extent the narrative water quality criteria are "applicable" within the meaning of CWA Section 303(d)(1)(C), the TMDLs are expected to achieve the District's narrative water quality criteria. Like numeric criteria, narrative criteria represent a quality of water that supports a particular designated use; when criteria are met, water quality will generally protect the use. See 40 CFR § 131.3(b). The TMDL endpoints are set at levels that will achieve all designated uses established for the relevant District waters. The narrative criteria refer to "amounts" of a pollutant that will cause or result in a particular water quality condition. In this case, each numeric criterion for a TMDL pollutant (or pollutant group) represents the referenced "amount" of that pollutant that is expected to avoid the adverse impacts described at §§ 1104.1(d) and (f). DOEE is not aware of any new information that necessitates revisions to the applicable numeric water quality standards and commenters asserting additional analysis or revisions are warranted do not identify any such information.

While the majority of the impaired waterbody-pollutant combinations addressed by the TMDLs herein are based on water column criteria exceedances, there are three "Dieldrin in Fish Tissue" listings in the Upper and Lower Anacostia mainstem segments and Kingman Lake that are based on exceedances of

[14] While the TMDL pollutants bind to sediment, the pollutants themselves do not settle to form deposits.

DOEE's fish tissue listing threshold of 2.5 parts per billion (ppb). Using the bioaccumulation factors on which the District's water column criteria are based (EPA, 2016), translation of the water column criterion for dieldrin (which is used as the TMDL endpoint) into a fish tissue equivalent results in a value that is lower (i.e., more stringent) than DOEE's fish tissue listing threshold. Therefore, the dieldrin TMDLs herein adequately address both the water column-based and fish tissue-based impairments.

Response Essay #11: Some commenters assert that there is an inadequate Margin of Safety.

CWA Section 303(d)(1)(C) directs that TMDLs be "established at a level necessary to implement the applicable water quality standards with seasonal variations and a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality." The Margin of Safety accounts for uncertainty about the relationship between pollutant loads and receiving water quality. It can be provided implicitly through analytical assumptions or explicitly by reserving a portion of loading capacity.

These TMDLs incorporate an implicit margin of safety in the form of modeling and other assumptions that are designed to cause the models to over-predict the presence of the TMDL pollutants in the river and its tributaries. This in turn results in allocations, which are developed to reduce pollution from predicted levels to amounts necessary to satisfy water quality standards, that call for reductions that likely are greater than necessary to move from actual conditions to achieving ambient water quality criteria. This type of implicit margin of safety is consistent with statutory and regulatory requirements, which require only that a margin of safety be incorporated and do not dictate how the margin of safety is expressed or that it necessarily be quantified.

The TMDL Report at Section 6.7 identifies several conservative assumptions and modeling choices that provide an appropriate implicit margin of safety as described above. These include the following:

- The discharge at Outfall 019 from the Northeast Boundary Swirl Concentrator Facility was included within the simulation, but the Northeast Boundary Swirl Concentrator Facility subsequently was taken out of service permanently. Outfall 019 remains an active CSS outfall and Outfall 019a has been added to accommodate discharges that may occur when the Anacostia River Tunnel reaches capacity. Discharges through Outfall 019a will be part of the allocation to the CSS. It is anticipated that discharges through Outfall 019 will be less frequent/lower volume with the operation of the tunnel than the modeled discharge from the Northeast Boundary Swirl Concentrator.
- DOEE modeled total DDT and used the most stringent of the metabolite criteria (DDE) as the TMDL endpoint for allocations. Using the most stringent of the applicable criteria for the three parameters as the endpoint ensures that the most stringent criterion for that individual metabolite is met. Further, doing so is more protective than required for the other DDT metabolites that have less stringent criteria. The TMDL ensures that the sum of all metabolites of DDT will not exceed the criteria associated with the most stringent metabolite, meaning that the metabolites individually will be below their criteria threshold.
- The 13 PAHs were placed into three groups based on ring structure, and the most stringent criterion within each group was used as the TMDL endpoint for allocations. Using the most stringent criterion to represent an entire PAH group as the TMDL endpoint ensures that the most stringent criterion for that individual PAH is met. Further, it is more protective than required for the other individual PAHs within that group that have less stringent criteria. Similar to above, the TMDL ensures that the sum of all PAHs within each group will not

exceed the criterion associated with the most stringent PAH, meaning that each PAH individually will be below their criteria threshold.

- When water quality monitoring data recorded a non-detect, concentrations were applied at approximately half the detection limit during model setup and calibration. When water quality monitoring data was recorded a non-detect, the value arguably could have been entered as zero. Recording as half the detection limit is a conservative assumption.

These TMDLs an implicit margin of safety satisfies the statutory and regulatory requirements, and it was not necessary to include an explicit margin of safety by reserving a portion of the loading capacity, as some commenters urged. Moreover, incorporation of an explicit margin of safety would be impractical in light of the large reductions and conversely very small loading capacity that would be available. For most of the TMDL pollutants, there is very little loading capacity available from which to carve out an explicit margin of safety and consequently any explicit margin of safety would be so small as to be almost meaningless.

Response Essay #12: Commenters asserted that the model simulation period (2014-2017) is not appropriate or is insufficiently conservative (i.e., does not sufficiently account for high levels of precipitation).

Model simulation period is used to calibrate the model, focusing on ensuring that the model shows reasonable agreement between observed and simulated pollutant concentrations in both the Anacostia River mainstem and its tributaries.

The model simulation period used here (2014-2017) represents the four-year period immediately preceding model development and the most recent data that was available at the time that the modeling work commenced. It also provides a representative range of precipitation conditions, capturing several extreme precipitation events that occurred during the 2014 through 2017 period. This continuous four-year simulation does in fact take into account a wide range of environmental conditions, including relatively wet (2014-2015) and dry periods (2016-2017), and is more conservative than basing the TMDL on a single year. Annual precipitation totals at Washington Reagan National Airport during the 2014-2017 period ranged from a low of 31.7 to a high of 45.78 inches of rainfall, which represents the 8^{th} percentile and 76^{th} percentile of rainfall totals for the 1871-2017 time period respectively. In addition, the 2014-2017 period was also used because of the availability of calibration data.

Commenters suggesting that data from 2018 was specifically not used to avoid a wet year are incorrect. In order to establish replacement TMDLs before the Court's vacatur of EPA's approval of the 2003 TMDLs, work on the model had to begin before 2018 data became available for use. DOEE also disagrees with commenters wo suggested that 2018 data needs to be included because it was a "wet" year that is representative of future conditions. Data from NOAA and the National Weather Service dating from 1871 through 2023 identify normal average precipitation over that 150-year period as 41.82 inches per year. The period 2014-2017 ranges from 45.78 inches (2014) to 35.6 inches (2017). The same data shows that 2018 represents an outlier (20 inches of precipitation or nearly 150% departure from historic norms), and not a trend. With the exception of 2020, annual precipitation during 2019-2022 was more in line with the 2014-2017 period and with historic norms (42.34 inches (2019), 57.34 inches (2020), 44.09 inches (2021), and 43.51 inches (2022)). See https://www.weather.gov/media/lwx/climate/dcaprecip.pdf (last accessed January 3, 2024).

Nevertheless, the TMDL also undertook an analysis of the TMDL scenario under two predicted future scenarios reflecting climate change, including increased precipitation. For a discussion of how the TMDLs consider climate change, see Section 7 and Appendix B of the TMDL Report and Response Essay #14.

Response Essay #13: Commenters asserted that the draft TMDLs do not adequately consider communities with environmental justice concerns.

The TMDL endpoints are set at a level necessary to achieve the District's water quality criteria, which are consistent with EPA's recommended criteria. In deriving its recommended criteria, EPA considered all designated uses that involve the ingestion of water and/or aquatic organisms.

For those TMDL pollutants that pose a cancer risk, EPA's recommended criteria represent the water concentration that is expected to increase an individual's lifetime risk of cancer from exposure to the particular pollutant by no more than one chance in one million for the general population.

DOEE recognizes that EPA's recommended criteria are based upon data derived from the general population, and that communities with environmental justice concerns may have higher rates of fish and shellfish consumption and otherwise may differ from the exposure factors used by EPA to derive its recommended criteria. While EPA calculates its recommended criteria at a 10^{-6} risk level, EPA also has stated that EPA believes that criteria based on a 10^{-5} risk level (i.e., no more than one chance in 100,000) are acceptable for the general population as long as States and authorized Tribes ensure that the risk to more highly exposed subgroups, such as subsistence fishers, does not exceed the 10^{-4} level (U.S. EPA, 2000a).

If one assumes that subsistence fishers in the District consume 130-142.4 grams per day (as compared with the 22 grams per day assumed by EPA in its recommended criteria), the cancer risk level would remain below 10^{-5} (U.S. NPS, 2018).

For copper and zinc, these chemicals do not pose a risk to human health at environmentally relevant levels. The most stringent criteria are those designed to protect aquatic life and are used as the TMDL endpoints. For more information on copper, please refer to EPA's 1980 Ambient Water Quality Criteria for Copper document:

> *"The available literature leads to the conclusion that copper does not produce teratogenic, mutagenic, or carcinogenic effects…The current drinking water standard of 1 mg/l is considered to be below any minimum hazard level, even for special groups at risk such as very young children, and therefore it is reasonable that this level be maintained as a water quality criterion. Since the current standard and hence the water quality criterion of 1.0 mg/l are based on organoleptic effects and are not toxicological assessments, the consumption of fish and shellfish is not considered as a route of exposure."*

For more information on zinc, please refer to EPA's 2002 National Recommended Water Quality Criteria. The current EPA recommended criterion for the protection of human health for the consumption of Organisms is 26,000 µg/L. The criteria designed to protect aquatic life are orders of magnitude more stringent and are used as the TMDL endpoints.

Response Essay #14: Commenters asserted that the draft TMDLs do not adequately account for climate change.

In response to this and similar comments on the 2021 draft TMDL Report, DOEE undertook an analysis of the fate and transport of the TMDL pollutants simulated under conditions of climate-induced changes in precipitation quantity and intensity, air temperature, and sea level rise. The climate change analysis was performed under two projected climate change scenarios and time horizons consistent with the Chesapeake Bay Program's medium-to-long-term planning outlook (Shenk et al., 2021). That analysis can be found in Section 7 and Appendix B of the TMDL Report.

A climate change analysis was performed for two time horizons: a near-term horizon around 2035 (2034-2037) and a long-term horizon around 2055 (2054-2057). For each time horizon, and for each of the ten TMDL pollutants/pollutant groups, two sets of model runs were conducted:

- The first scenario (Climate Change Scenario) was designed to assess change in water column concentrations for each pollutant and pollutant group under future climate scenarios in tandem with the TMDL allocation scenario. The model setup used in the climate change analysis was unchanged from the model setup used in developing the TMDL allocation scenario except for the projected changes in the three climate factors (precipitation quantity and intensity, air temperature, and sea level rise).
- The second scenario (Natural Attenuation Scenario) was designed to estimate how long natural attenuation of toxic pollutants in bed sediment will take considering climate change impacts relative to the natural attenuation results documented in the TMDL.

The results of these model runs are discussed in Section 7 and Appendix B of the TMDL Report.

DOEE disagrees with commenters who fault the climate change analysis because it does not take into account factors such as climate-induced changes in submerged aquatic vegetation (SAV), mussels, stream bank erosion and other factors that may affect the fate and transport of the TMDL pollutants. While these and a myriad of other potential climate-induced changes could affect the fate and transport of the TMDL pollutants, the quantity and intensity of precipitation, air temperature, and sea level rise are the most significant (Tetra Tech, 2023a). While DOEE agrees that SAV could potentially help filter out contamination from the water column, the extent of SAV potential filtering effect on the TMDL pollutants is not well-established. While not a separate factor, streambank erosion is captured by the model simulation in that erosion would have occurred in connection with intense events captured within the simulation period and thus the model adequately represents instream conditions during the simulation period.

Some commenters pointed to loss of SAV due to significantly increased rainfall in 2018, the precipitation in 2018, but that appears to represent an outlier and there is no evidence that the quantity of SAV in 2018 is representative of future conditions. While DOEE agrees that the District will experience warmer average temperatures due to climate change, more frequent and intense heavy rain events, and higher tides, the amount of precipitation in 2018 appears to be an outlier. In fact, in the last 50 years, the District's average annual temperature increased by 2°F (DOEE, 2019). Specifically, within the National Park boundaries of Rock Creek, the annual average temperatures increased 2°F from 1950 to 2013, with the greatest increase in summer (NPS, 2017). Average annual rainfall has not changed significantly. However, more rainfall is occurring in the fall and winter and less in the summer (DOEE, 2019). By contrast, data from NOAA and the National Weather Service dating from 1871 through 2023 appear to show that 2018 represents an outlier (20 inches of precipitation or nearly a 150% departure from historic norms) and there is no data to suggest it represents a dramatic upward trend from the 2014-

2017 period. With the exception of 2020, annual precipitation during 2019-2022 was more in line with historic norms (42.34 inches (2019), 57.34 inches (2020), 44.09 inches (2021); 43.51 inches (2022)). See https://www.weather.gov/media/lwx/climate/dcaprecip.pdf (last accessed January 3, 2024).

DOEE disagrees with those commenters who assert that the climate change analysis is overly simplistic. The analysis is in line with the larger regional (and widely accepted) modeling efforts for the Chesapeake Bay.

Response Essay #15: Some commenters discussed whether each discharge point within the MS4 or CSS should receive a separate WLA.

The permit-specific wasteload allocations assigned to the MS4 and CSS have been disaggregated at the subwatershed level. The expression of wasteload allocations for stormwater as aggregate allocations to these types of point sources is permissible. *See Anacostia Riverkeeper v. Jackson,* 798 F. Supp. 2d 210, 249-51 (D.D.C. 2011) (CWA does not require that wasteload allocations be assigned to each individual discharge point within an MS4 system). EPA guidance recommends that, when sufficient information is available, wasteload allocations be disaggregated to the degree supported by the available information and suggests various approaches, including developing individual wasteload allocations by subwatershed, as was done here. Memorandum from Andrew D. Sawyers and Benita Best-Wong to Water Division Directors, Regions 1-10, *Revisions to the November 22, 2002 Memorandum "Establishing Total Maximum Daily Loads (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs* (Nov. 26, 2014). Therefore, DOEE believes that wasteload allocations for the MS4 and the CSS were properly represented as permit-specific allocations.

C. Individual Comments and Responses

1. The commenters ask that DOEE ensure that water quality and the overall health of the Anacostia River watershed is safeguarded against all forms of pollution. The commenters further ask for a stricter pollution diet to limit sources of toxic pollutants such as runoff from contaminated sites, other stormwater runoff, and combined sewer overflows.

   Response: See Response Essay #1.

2. The commenters cite Table 3-1 on page 35, which lists the historic contaminated sites in the Anacostia River watershed in the District. The commenters ask for an explanation of why these contaminated sites are treated as nonpoint sources in the TMDL. The commenters also ask how agencies will reduce contaminant loads from these sites if the sites are named as nonpoint sources?

   Response: See Response Essay #2. (As a result of revisions to the TMDL Report, Table 3-1 can now be found on page 29.)

3. The commenters cite page 38 and note that Figure 2-2 referenced in the text is not present in the report or in the List of Figures. The commenters request that the reference be corrected or the missing figure be added.

Response: As a result of revisions to the TMDL Report, this reference to Figure 2-1 can be found on page 26. We thank the commenter for noting this discrepancy. The text should have referenced Figure 2-1. The reference has been corrected in the TMDL Report.

4. The commenters cite page 40 and note that the report reads "[t]ypically, discharge monitoring report (DMR) data included flow, but not toxic pollutant concentrations." The commenters ask shouldn't all pollutants be monitored for, especially from the MS4, NPDES permit sites, and CSS?

   Response: As a result of revisions to the TMDL Report, the quoted can be found on page 33. Monitoring conditions are established in NPDES permits that are consistent with 40 CFR §§ 122.44(i) and 122.48. Monitoring conditions are specific to each NPDES permit and can vary based on several factors, such as permit type, effluent limitations, pollutants discharged or expected to be discharged, discharge frequencies, and flow or pollutant effect on the receiving water. Beyond the monitoring conditions for specific pollutants established in the permits, there is no blanket requirement as to what all pollutants be monitored for. All available monitoring data reported by the NPDES permitted facilities were used in the TMDL development process.

5. Also on page 40, the commenters cite "For facilities that did not have data enumerating toxic pollutant concentrations, the WQC for toxic pollutants (e.g., DDT, chlordane, dieldrin) in the District's WQS were used." The commenters ask if this means concentrations in the WQS (WQC) were used as the concentrations "discharged" from the outfalls? Isn't this going to underestimate the pollutant loads too much? What if an outfall discharges a very high concentration of pollutant in actual? Without actual monitoring data, isn't it too inaccurate to use WQC as a concentration in the discharge?

   Response: As a result of revisions to the TMDL Report, the quoted language can be found on page 33. The referenced text explains that, when there is no data, it was assumed that the facility's discharges contained the TMDL pollutants at concentrations equal to the District's water quality criteria. See Response Essay #3 as to why this is an appropriate approach.

6. Continuing on page 40, the commenters note that there is no explanation for the abbreviation for MGD. The commenters request an explanation for the abbreviation.

   Response: As a result of revisions to the TMDL Report, the abbreviation MGD is no longer used. For the commenters' awareness, MGD stands for million gallons per day.

7. Also on page 40, the commenters cite "[t]he TMDL model simulation period was from 2014 through 2017; therefore, it does not account for the on-the-ground changes due to the operation of the Anacostia tunnel system since March 2018." The commenters explain that CSO overflow was reduced by about 40% in 2009 and about 60% in 2011. The reduction was achieved by improving maintenance of the then, existing system. The reduction should be taken account into since the simulation period is from 2014 and 2017.

   Response: As a result of revisions to the TMDL Report, the quoted language can be found on page 33. Custom FTABLES (function tables in the TMDL watershed model (LSPC)) were developed for sewer lines that are part of the District CSS. The function tables describe the relationship between water depth, surface area, water volume, and outflow in the segment. The CSS FTABLES were used to define storage overflow relationships that replicate conditions in which the CSS segments only discharge during significant rainfall events. The FTABLES were developed using information provided by D.C. Water such that during LSPC model setup, and those tables were then used as a guide in setting up the CSO volumes in the LSPC model. The information provided by D.C. Water included overflow estimates for the 2012-2015 time period, which take into account the maintenance conducted in 2009 and 2011. Therefore, the maintenance referenced in the comment was accounted for in the 2014 to 2017 modeling period.

The quoted language explains that the completion of the Anacostia River Tunnel Project in 2018 and completion of other tunnels (e.g., Northeast Boundary Tunnel Project) in the Anacostia River system occurred after the modeling simulation period of 2014-2017.

With respect to the impact of the TMDL with the completion of the Anacostia River Tunnel Project in 2018 and additional progress toward completion of other tunnels, see Response Essay #4.

8. Continuing on page 40, the commenters state that, overall, concentrations from outfalls (MS4, NPDES, and CSS) seem to be assumed, not monitored. We wonder if the assumption can allocate the load appropriately. For example, if X amount of allocation was made to a MS4 and in actual if there is no pollutant being discharged from the outfall, a reduction is impossible.

   Response: See Response Essay #3 for a discussion of representation in the model of the four individually permitted facilities. See Section 3.2.2 of the TMDL Report and Section 3.3.5 of the TMDL Modeling Report for information regarding how discharges from the MS4 and CSS are represented in the model.

   The data for these sources were not assumed, rather, the parameterization of land uses and representation of point sources was guided by best available data, and refined, if necessary, with assumptions when appropriate, to calibrate the model. The model in turn, was used to simulate the loads for all sources. In other words, the TMDL watershed model (LSPC) results for the contributing upland areas within the defined boundaries of the permitted areas were used to estimate the respective contributions for the District MS4 and CSS. Individually permitted NPDES sources were configured based on available data from those facilities. Calibration ensured that the model simulation well represented observed water quality data; therefore, contributions from each source were determined to be reasonable based on available data, literature values, etc.

   During the calibration process, monitoring data as available were used to characterize the various pollutant loading pathways to surface and groundwater water quality simulated in the calibrated watershed model. The calibrated watershed model incorporates runoff from the various land use and service area types and their associated pollutant loading, as well as pollutant loading from contaminated sites, groundwater and interflow, atmospheric deposition, point sources, and instream bed sediment. The resulting allocations developed using the calibrated model are therefore appropriate.

9. The commenters cite page 47 and the text that reads "The Maryland portion of the Anacostia River watershed will be assigned an upstream nonpoint source load for all DC pollutants being addressed by this TMDL for which MD does not have impairment listings." The commenters

inquire why this is a non-point source? The commenters also ask don't point sources such as MS4 outfalls in MD need to be addressed for DC pollutants listed impaired? Isn't it possible that the discharges from MD may have been elevating the baseline concentration to an extent that may not violate the MD WQS but additional pollutant inputs from DC may have been causing the violation in DC? MD discharge may be doing bottom-up?

Response: As a result of revisions to the TMDL Report, Section 3.1.1 at pages 28-29 now states: "This TMDL report presents this upstream loading from Maryland for all ten toxic pollutants. These upstream loads are presented as a single value, representing the total load from the upstream subwatershed; however, it could include both point and nonpoint sources. For the purposes of this analysis, the load is treated as a single nonpoint source load (See Section 3.3.5 of the TMDL Modeling Report for more information) (Tetra Tech, 2023b)." For a discussion of the boundary condition with the upstream Maryland waters, see Response Essay #5.

10. The commenters cite page 52 and the text that reads "simulated reductions to bed sediment in the tidal segments were geared at ensuring the endpoints were achieved." The commenters note that simulation of reduction to bed sediment is good but ask how can it be ensured that the reduction to bed sediment could occur? The commenters explain that it is their understanding that pollutants in bed sediment is considered a non-point source. Differently from point sources such as MS4, the reduction may not be mandatory. Will the ARSP cover all pollutants in addition to PCB?

    Response: As a result of revisions to the TMDL Report, Section 5.3 at page 40 now states: "simulated reductions to bed sediment in the tidal segments were made to ensure the endpoints were achieved during dry, low flow periods." See Response Essay #6.

11. The commenters cite page 55 and the following text, "[a] methodology was developed to use changes in bed sediment concentrations during the 4-year model simulation period to extrapolate and predict bed sediment concentrations over time and identify the length of time that it will take, after the load reductions are implemented, for natural attenuation to result in the attainment of the TMDL endpoints" and "[t]he estimated timelines for natural attenuation to result in attainment of the TMDL endpoints after the TMDL scenario is implemented are provided in Table 5.1." The commenters ask if a reduction to bed sediment is going to be implemented, why does natural attenuation need to be considered? Once the pollutants in the sediment were removed, the reduction should be immediately effective.

    Response: As a result of revisions to the TMDL Report, Section 5.4 at page 40 now states: "A methodology was developed to use changes in bed sediment concentrations during the 4-year model simulation period to extrapolate and predict bed sediment concentrations over time and identify the length of time that it will take, after the load reductions are implemented, for natural attenuation to result in the attainment of the TMDL endpoints. Table 5.1 provides the estimated timelines for natural attenuation to result in attainment of the TMDL endpoints after the TMDL scenario is implemented." See also Response Essays #6 and #7.

12. Continuing on page 55, the commenters cite Table 5-1 and state that the table indicates that it will take as long as 210 years to meet the WQC as seen in Kingman Lake-1 for PAH3? Isn't it too slow?

Response: As a result of revisions to the TMDL Report, Table 5-1 now appears at page 44. The estimated length of time to meet WQC for Kingman Lake is impacted by slow flushing rates due to the geomorphology of the waterbody itself.

Further, PAHs share many physical and chemical characteristics (Smith et al. (1998)), including:

- Slow biodegradation rates once sorbed to sediment;
- Relatively low solubility and vapor pressure;
- Strong tendency to partition from water into biota and particulate and dissolved organic matter;
- Strong adherence to soils and sediments; and
- Accumulation in lipid stores of aquatic organisms.

In aquatic systems, PAHs generally do not dissolve in water but rather sorb to sediment particles, settling to the river or stream bottom. PAHs can be persistent in soils and sediment particles found in surface waters and are ubiquitous in the environment due to continuous releases from combustion processes and contaminated soils.

While the CWA directs that TMDLs be established at a level necessary to implement applicable water quality standards, the CWA and regulations do not specify any particular time period required to achieve water quality standards. The time period estimated to achieve water quality standards necessarily will depend upon the nature of the pollutant, the applicable water quality standards and the nature of the sources. Because Kingman Lake has substantial legacy pollution and the characteristics of PAH 3, it will take many years for legacy PAH 3 concentrations (which have extremely stringent water quality criteria) to reduce by natural attenuation to meet the TMDL endpoints, even after the TMDL allocations have been achieved.[15]

See also Response Essay #7.

13. The commenters cite page 58 and the following, “Instead, the overall loading from MD and the prescribed reduction needed from MD to achieve downstream water quality in DC will be presented as a single loading condition for each pollutant.” The commenters add that they think WLAs should be allocated to MD point sources for the identified pollutants in DC since the allocation reduction will be enforceable in MD. If reduction is not necessary from MD point sources to meet DC WQS, it should be noted that way after the TMDL allocation.

Response: Due to revisions to the TMDL Report, the referenced text no longer appears in the TMDL Report. Nevertheless, the TMDLs do assign a boundary condition to upstream sources from Maryland expressed as a load allocation. For a discussion of the boundary condition with Maryland, see Response Essay #5.

[15] While not an assumption of the TMDLs nor incorporated in the TMDL scenario, Kingman Lake is one of the areas identified as an early action area for active remediation as part of the ARSP. This remediation will reduce the PCB risk in sediment by about 90 percent. It is reasonable to anticipate that remediation will also reduce co-located PAH 3 and decrease the time it takes to meet WQC for PAH 3.

14. The commenters cite the following footnote, "[3][d]aily loads presented for Anacostia #1 include upstream loads from Anacostia #2, tributaries, and direct drainage." The commenters explain that if the upstream load is included in the downstream Anacostia #1, the load for the Anacostia #1 should be larger than that for the Anacostia #2. There are similar descriptions at other places but were not written up. The commenters ask for all to be clarified.

Response: Due to revisions to the TMDL Report, the TMDL and annual load tables have been revised and no longer appear as described in this comment. The commenter is correct in that the loads presented for Anacostia #1 are cumulative and include all upstream loads, tributary loads, and direct drainage. Therefore, the loads presented for Anacostia #1 are larger than the loads presented for Anacostia #2. The revised TMDL and annual load tables can be found at Sections 6.3 and 6.4 of the TMDL Report, respectively.

15. The commenters state that the draft TMDLs still do not include daily loads for sources of toxic pollution. The commenters state that the draft TMDLs claim to add daily loads in the form of wasteload allocations and load allocations allocated to individual water segments, but these "loads" would more appropriately be labeled "loading capacities" under the applicable regulations.

Response: This comment refers to the 2021 draft TMDL Report. DOEE continues to believe that it is appropriate for the "daily" expression of a TMDL to be allocated to individual water segments. EPA's regulations define load allocations and wasteload allocations as "portions" of a waterbody's loading capacity. 40 C.F.R. §§ 130.2(g) and (h). Accordingly, LAs and WLAs can be expressed as a form of loading capacity. Nevertheless, in response to this and similar comments, the TMDLs were revised to incorporate source-specific daily maximum loads for each waterbody and pollutant combination. This represents a significant revision that DOEE made between the 2021 and 2023 drafts. These loads are presented in the tables in Section 6.3 of the TMDL Report. See Section 5.5 of the TMDL Report for a discussion of how these daily loads were calculated.

16. The commenters continue that in the draft TMDLs, each water segment has one daily aggregate "load allocation" for each pollutant, representing the total amount the water can absorb from all nonpoint sources, and one daily aggregate "wasteload allocation" for each pollutant, representing the total amount the water can absorb from all point sources. The commenters suggest that there are no daily load allocations or daily wasteload allocations assigned to any sources whatsoever. Therefore, the "daily loads" are such in name only.

Response: See the response to Comment #15.

Because of the nature of the impairment and the pathway of exposure, the TMDLs continue to include annual loads as well as daily loads. Given the legacy nature of the pollutants, estimates of annual loading provide a more appropriate time frame for managing each of the source sectors. In addition, the TMDL endpoints, of which most are based on DOEE's human health water quality criteria and adopted from EPA's 2015 recommended human health criteria update, are based on bioaccumulation of these pollutants through the food chain and in fish tissue over time as well as a lifetime exposure of these pollutants to humans through a lifetime of fish consumption. Therefore, a large daily spike or even multiple infrequent daily spikes in water concentrations would not present a human health risk. Rather, the long-term water column concentration in tandem with long-term exposure is more appropriate to consider.

Therefore, for these TMDLs, a non-daily allocation is meaningful in understanding the pollutant/waterbody dynamics. Ultimately, the TMDL Report includes both daily (i.e., TMDLs) and annual allocations.

17. The commenters assert that the draft TMDLs do not include daily time increments in all of the load allocations and wasteload allocations, and this error must be corrected in order to comply with the Clean Water Act.

    Response: See the response to Comment #15.

18. The commenters state that the failure to allocate daily loads to sources prevents implementation of the loads as a practical matter. The commenters suggest that daily loading capacity figures for each water segment have no value in cleaning up existing pollution unless they are disaggregated and divvyed up into allocations for individual point sources and nonpoint sources – numbers that can then be incorporated into permit limits as intended under the Clean Water Act. The commenters add that an aggregate daily loading capacity is simply not implementable in permits for individual sources. The commenters also add that TMDLs must include daily pollution caps for polluters, not just daily pollution capacities for waters, in order to achieve steady, daily reductions in pollution and prevent daily spikes and violations of water quality standards.

    Response: See the responses to Comments #15 and 16.

19. The commenters state that while the draft TMDLs do not include daily loads for individual sources, they do include annual loads for individual sources. Unfortunately, the annual loads for point sources, or wasteload allocations, are legally insufficient.

    Response: See the responses to Comments #15 and 16.

20. The commenters state that many of the District's annual wasteload allocations are not true loads. The commenters add that the District admitted it has no data on the amount of toxic pollutants most of the permitted point sources are discharging.

    Response: See Response Essay #3.

21. The commenters state that the District has acted arbitrarily and unlawfully in failing to collect this fundamental data in the eleven years the District has had to develop these court-ordered TMDLs, especially when the 2003 TMDLs outline four specific steps for collecting this monitoring data from permitted point sources.

    Response: See Response Essay #3. While additional data is always helpful, it is not required. *Cf. Sierra Club v. U.S. Environmental Protection Agency,* 162 F. Supp. 2d 406, 413 n. 5 (D. Md. 2001). While the source-specific data is limited, the District collected significant instream and sediment data from the receiving waters. These draft TMDLs have been developed based on four datasets collected over a long period of time. These include (1) the District's ambient monitoring dataset collected on account of an EPA-approved water quality monitoring plan pursuant to CWA Sections 106(e)(1) and 305(b), (2) monitoring datasets from DMRs provided by NPDES permitted facilities, (3) monitoring data collected through contractual agreements, and (4) data solicited from the public. It is DOEE's position that, together, these datasets are sufficient to develop and calibrate the model and calculate the TMDLs.

22. The commenters state that the District simply assumed that point sources are discharging most concentrations of toxic pollutants at levels that are equal to the District's water quality criteria concentrations (except for PAH 1). The commenters add that these point sources could currently be discharging at levels above criteria concentrations or below criteria concentrations. Further, the commenters explain that this uncertainty is problematic because it means that any assigned annual wasteload allocations could actually allow increases in pollution discharges instead of reductions, or could allow stagnant pollution discharge levels.

    Response: See Response Essay #3.

23. The commenters claim that the District assumed without knowing that most point sources are currently discharging toxic pollutants at criteria concentrations, and also assigned wasteload allocations at that same criteria concentration level, representing a 0% reduction if their assumptions about current conditions are accurate. The commenters include that the annual loads in Appendix C of the draft TMDLs include wasteload allocations that represent a 0% reduction for point sources D.C. Water and Super Concrete Corporation, for all pollutants except PAH1. And for point sources Washington Navy Yard and Pepco, 0% reductions (or, puzzlingly, significant increases in the case of water segment Anacostia #2) were required for PAH 1 in their wasteload allocations.

    Response: See Response Essay #3. For PAH 1 specifically, the most stringent applicable numeric water quality criterion (50 µg/L, Class C waters) is much higher than any monitored concentrations in the water quality monitoring data. In other words, all monitored waterbodies have PAH 1 concentrations well below the criteria. As such, no source was required to reduce its PAH 1 pollutant loads from the estimated baseline loads. In fact, because the WLAs for the four individually permitted facilities were calculated using the detection level for PAH 1, the resulting WLAs were larger than the estimated baseline loads (because all sources discharge well below water quality criteria). While DOEE expects that permittees will not discharge more PAH 1 than they currently do, as demonstrated by the 0% reduction in the TMDL tables, the objective of the TMDL is to establish loads for toxics that are necessary to attain and maintain applicable water quality standards and these allocations achieve that objective.

24. The commenters explained that guessing at the current pollution discharge levels and then assigning wasteload allocations of the water quality criteria concentrations is not a load at all, but is rather a directive to comply with water quality criteria – something that point sources are required to do in any event. Further, the commenters add that if a TMDL's wasteload allocations for point sources amount to nothing more than an instruction to comply with water quality criteria, the TMDL is missing the reduction requirements that are easiest to enforce and achieve.

    Response: See Response Essay #3.

25. The commenters state that the District's annual wasteload allocations for stormwater to its Multi-Sector General Permit are improperly represented as aggregate allocations.

Response: This comment relates to the 2021 draft TMDL Report. The 2021 TMDL Report was revised in 2023 to include individual maximum daily and annual WLAs for sources covered by the MSGP. This represents a significant revision that DOEE made between the 2021 and 2023 drafts. The loads associated with the MSGP were estimated using a GIS overlay of site boundaries, land cover data, and unit area runoff data (See Section 3.2.2 in the TMDL Report and Section 3.3.5.2. in the TMDL Modeling Report for more information). Tables 6-43 and 6-44 of the TMDL Report provide the individual daily and annual wasteload allocations to the facilities covered by the MSGP.

26. The commenters explain that forty-nine industrial facilities are covered by the Multi-Sector General Permit in the District but that none of those permitted facilities will be assigned individualized wasteload allocations under these draft TMDLs. The commenters add that these facilities must be individually evaluated and assigned individual wasteload allocations, and the draft TMDLs should prohibit the use of general permits for construction activities and for industrial stormwater. Further the commenters state that any facility requiring a construction stormwater permit or an industrial stormwater permit must be issued an individual permit with water quality-based effluent limits for toxic pollutants.

Response: See the response to Comment #25. Further, the way in which wasteload allocations will be implemented through NPDES permits is beyond the scope of these TMDLs.

27. The commenters state that aggregating stormwater wasteload allocations undercuts the efficacy of the allocations and ignores EPA's clear guidance to disaggregate allocations.

Response: If this comment addresses the aggregate WLA allocated to the MGSP sources in the 2021 draft TMDLs, see response to Comment #25. If it pertains to the WLAs provided to the MS4 and CSS, see Response Essay #15.

28. The commenters assert that the draft TMDLs fail to provide reasonable assurances that source reductions will occur and will lead to achievement of water quality standards, and therefore the draft TMDLs must be modified to maximize point source reductions.

Response: See Response Essays #8 and #9.

29. The commenters explain that rather than run model scenarios that maximize point source reductions, the draft TMDLs largely rely on significant nonpoint source reductions, 59 percent of which are either 99% or 100% reductions. The commenters add that the draft TMDLs do not explain how these complete or near-complete eliminations of nonpoint source pollution will occur, or are even possible without permits or regulations.

Response: See Response Essays #8 and #9.

30. The commenters state that the draft TMDLs contain no implementation plan and point to only vague hopes of implementation through "best management practices" and pollution programs that were not modeled and that have mostly been in place for years without achieving the necessary reductions. The commenters add that EPA has previously rejected similar offerings of reasonable assurances in TMDLs, even when an implementation plan was included in the TMDL, which was not the case here.

Response: See Response Essay #8.

31. The commenters state that the draft TMDLs concede that even if these unrealistically high nonpoint source reductions are achieved, water quality standards would still not be attained during dry weather conditions without including some other reductions in the model. Further, the commenters note that in order to model attainment of water quality standards during dry weather, the modelers had to factor in the "natural attenuation" of toxic pollutants in sediment, meaning that even if all of the hoped-for reductions in point source and nonpoint source pollution occur, water quality standards will not actually be achieved until these toxic loads naturally decrease over many years, sometimes a hundred or more years.

    Response: See Response Essays #6, #7, and #8.

32. The commenters state that the draft TMDLs identify a number of nonpoint pollution programs that the agencies hope will reduce toxic pollution, none of which were modeled to determine their impacts on these TMDLs, and most of which have been in place, at least in part, for multiple years without achieving compliance with toxic pollutant water quality criteria.

    Response: See Response Essays #7, #8 and #9.

33. The commenters note that the cited Chesapeake Bay Agreement was signed in 2014 and is a voluntary, multi-jurisdictional agreement among six states and the District of Columbia that outlines eleven broad "goals" for the Bay. The commenters add that the draft TMDLs provide no explanation of how this voluntary, seven-year-old agreement will suddenly reduce toxic pollutant levels to a point where the Anacostia River watershed will attain applicable water quality standards.

    Response: See Response Essays #7 and #8.

34. The commenters note that draft TMDLs also cite the Anacostia River Sediment Project (ARSP) as an example of why the modeled nonpoint pollution loads will be achieved. The commenters state this project was not factored into the modeling. The commenters add that the sediment project is focused on PCB pollution – a pollutant not subject to these TMDLs and that the draft TMDLs claim that the PCB-focused project "will also beneficially reduce other pollutants," but provide no data or support for that claim. Further, the commenters add that, there is only an interim record of decision for the project that is focused on "early action areas" or "hot spots" for PCB pollution. It is unclear when these PCB hot spot cleanups will take place, or when a final record of decision will be made.

    Response: See Response Essays #6 and #8. The commenter is correct that the ARSP is not incorporated into the TMDL scenario, is not an assumption of the TMDLs, and focuses on PCB contamination. Nevertheless, it is appropriate to discuss the ARSP in connection with Reasonable Assurance. When the ARSP is implemented, it is expected that remediation of PCB-contaminated sediment likely will also reduce other sediment-bound pollutants, including the TMDL pollutants, that are co-located. It is reasonable, therefore, to conclude that the remediation of contaminated sediment would decrease the time it will take for water quality to approach the TMDL endpoints, and therefore is appropriately considered in the Reasonable Assurance discussion.

35. The commenters note that the draft TMDLs cite the 2016 Consolidated TMDL Implementation Plan, the combined sewer overflow Long Term Control Plan, and various voluntary programs, MS4 control measures, and best management practices as evidence of reasonable assurances. The draft TMDLs do not explain why this consolidated plan will assure compliance with these new draft TMDLs. The combined sewer overflow Long Term Control Plan, for its part, has thus far resulted in the completion of one combined sewer storage tunnel on the Anacostia. While this tunnel and future tunnels and combined sewer overflow control measures will presumably reduce toxic pollutants to the extent they are present in combined sewer overflow, the draft TMDLs do not model or quantify any reductions. Finally, vague references to voluntary programs or MS4 permit terms do not explain why the specific and significant numeric reductions called for in the draft TMDLs will be achieved.

    Response: All of the stormwater in the watershed flows in areas that are covered by the District MS4 permit, to the CSS, and/or in areas occupied by facilities covered by the MSGP, all of which are point sources, not nonpoint sources, and all of which received wasteload allocations, not load allocations.

    As noted in the comment, the LTCP addresses controls to reduce discharges through combined sewer overflows and accordingly it is reasonable to conclude that implementation of the LTCP will reduce the discharge of toxic pollutants present in combined sewer overflows.

    Development of a Consolidated Implementation Plan (CIP) is a requirement of the MS4 permit, which states:

    > "2.2.1 Maintaining and Refining TMDL Databases and Modeling Tools - The Permittee shall continue to update the Consolidated TMDL Implementation Plan modeling tool and associated databases, which shall be used in the development of revised plans, schedules, or strategies. The modeling tool and/or associated databases shall also be used to provide consistent tracking of progress against milestones and benchmarks. Milestone and benchmark progress shall be included in each year's Annual Report for effective utilization by multiple audiences, including the public".

    The District updated its TMDL CIP in 2022. Since the purpose of the CIP is to implement TMDLs, it is reasonable to conclude that implementation of the CIP will reduce discharges of toxic pollutants to and through the MS4. The references to modeling are part of the provisions of the MS4; there is no requirement that efficacy of implementation measures be modeled and such modeling is beyond the scope of these TMDLs.

    Regardless, the only load allocations in these TMDLs are to the Contaminated Sites and to the boundary condition with Maryland. For a discussion of those load allocations, see Response Essays #2 and #5. Reductions through implementation of the allocations to the MS4 and CSS are point source reductions. The purpose of Reasonable Assurance is to provide a level of confidence that reductions from nonpoint sources will occur. See Response Essay #8.

36. The commenters state that planned monitoring measures, while a start, fail to provide reasonable assurances that modeled reductions will be achieved. The draft TMDLs state that the District measures toxic pollutants in fish tissue "as funding is available." However, this sporadic monitoring is used to develop fish consumption advisories and it is not clear this type of data can be used to measure compliance with all applicable water quality standards. The commenters note that draft TMDLs also state that the District will use monitoring data from NPDES permits to assess progress towards implementation of the TMDLs. But this permit monitoring data is almost certainly incomplete, as the draft TMDLs elsewhere state that permit monitoring data does not exist for most of the pollutants and permitted sources. The commenters assert that in order to assess progress under these TMDLs and towards attainment of water quality standards, the draft TMDLs should incorporate a complete toxic pollutant discharge monitoring plan, as well as in-stream water monitoring.

Response: See Response Essay #8 and the response to Comment #106.

37. The commenters note that the draft TMDLs include information on the natural attenuation of toxic pollutant levels in sediment over time, which the draft assumes will occur because some of the toxic pollutants are now banned. The commenters add that natural attenuation of toxic pollutants in sediments to the point of water quality criteria attainment is predicted to take decades in most cases, or even more than 100 or 200 years in the Kingman Lake-1 water segment.

Response: See Response Essay #7 and the response to Comment #12.

38. The commenters state that it is unclear whether these predicted reductions will only occur on this time scale if all point source and nonpoint source reductions in these draft TMDLs are achieved, and if so, the amount of time in which those source reductions are assumed to occur. In other words, it is unclear whether the natural attenuation estimates will be longer if the modeled point source and nonpoint source reductions in these TMDLs do not occur, or do not occur quickly.

Response: See Response Essay #7.

39. The commenters state that the TMDL drafters determined that "load allocations (LA) to bed sediment are not required because natural attenuation is the mechanism that will result in attainment of the TMDL endpoints." In other words, remediation will not be required in these TMDLs because sediment is not treated as a nonpoint source.

Response: The referenced language is from the 2021 draft TMDL Report and does not appear in the 2023 draft Report or the final Report. For a discussion of how the model and the TMDLs treat bed sediment, see Response Essay #6.

40. The commenters state that the draft TMDLs concede that remediation of the contaminated sediment through dredging, capping, or other measures would result in faster attainment of water quality criteria. Yet, the draft merely states that remediation measures "may be appropriate to consider" at a future time when existing point source and land-based nonpoint sources are no longer causing violations of criteria on their own, without consideration of

sediment. The commenters add that the draft then acknowledges, confusingly, that remediation measures are actually likely to occur under the Anacostia River Sediment Project.

Response: See Response Essay #6 and #8 and the response to Comment #34.

41. The commenters state that the reliance on the passage of many decades in order to fully implement this TMDL and attain water quality criteria via natural attenuation of sediment, instead of actually addressing sediment contamination as the nonpoint source that it is and imposing load allocations, fails to provide any assurance that TMDL endpoints will be achieved, much less that they will be achieved on any kind of reasonable time scale.

    Response: See Response Essay #6 and #7.

42. The commenters claim that DOEE and MDE must provide reasonable assurances or reassign the entire load reduction to point sources.

    Response: See Response Essays #8 and #9.

43. The commenters state that the draft TMDLs do not demonstrate compliance with all applicable water quality standards.

    Response: See Response Essay #10.

44. The commenters state that DOEE incorrectly assumes that numeric limits will attain narrative standards for Class C & D waterways. The commenters assert that DOEE assumes that, because the draft TMDLs implement "the most stringent criteria in the District's WQS regulations," attainment of the numeric criteria will also "attain and maintain the narrative criteria". The commenters assert that DOEE cannot punt its duty to make these findings by saying that it is relying on EPA's nationally recommended Human Health Ambient Quality Criteria. These criteria were published by EPA in 2015 – over six years ago. DOEE's uncritical reliance on EPA's recommended criteria is not enough to show that the draft TMDLs implement the most stringent criteria available.

    Response: See Response Essay #10.

45. The commenters state that DOEE's assumption is also undermined by the District's own water quality standards regulations. The commenters note that those regulations state that "EPA has not calculated [numeric] criteria" for constituents that are the subject of these draft TMDLs such as certain polycyclic aromatic hydrocarbons. Instead, "permit authorities will address these constituents in NPDES permit actions using the narrative criteria for toxics." The commenters state that lacking numeric criteria for constituents such as certain polycyclic aromatic hydrocarbons, DOEE cannot logically assume that attainment of the numeric criteria for the other constituents that are the subject of these draft TMDLs is sufficient to attain the narrative criteria of Class C and D waterways.

    Response: See Response Essay #10. The commenters do not accurately depict the footnote in the District's water quality standards regulations that refers to use of the narrative criteria for toxics when numeric criteria do not exist for particular constituents. These TMDLs address the pollutants identified within the TMDLs and those pollutants were included based on impairments documented on the District's Section 303(d) List of impaired waters. Other PAHs, or other pollutants, that are not explicitly addressed within these TMDLs are not covered by these TMDLs. If DOEE later finds that additional PAHs, or other pollutants, are impairing the designated uses of the Anacostia River, its tributaries, and/or Kingman Lake, those pollutants will be placed on the District's Section 303(d) List and a TMDL will be developed. These TMDLs are not intended to address all possible forms of toxic pollution; only the toxic pollutants explicitly monitored, modeled, and analyzed within the TMDL Report.

Notably, there are over 100 different types of PAHs. The TMDL Report expressly states that the TMDLs cover the 13 PAHs that are known to occur at environmentally relevant levels in the Anacostia River, its tributaries, and Kingman Lake. These PAHs have pollutant-specific numeric criteria and all of the applicable PAH criteria, which are protective of the designated uses of Class C and D waterways, are addressed by these TMDLs.

46. The commenters claim that the agencies incorrectly assume that attainment of the numeric criteria will also attain and maintain the District's narrative standard prohibiting the discharge of substances in amounts that "[c]ause injury to, are toxic to, or produce adverse physiological or behavioral changes in humans, plants, or animals." The commenters add that even accepting this unsupported assumption at face value, the draft TMDLs suffer from a more fundamental flaw: they entirely ignore the other five applicable narrative criteria.

    Response: See Response Essay #10.

47. The commenters state that the Draft TMDLs do not demonstrate protection of all existing and designated uses. The commenters note that the agencies further state that because EPA's WQC "are the most stringent criteria in the District's WQS regulations, attainment of these criteria will . . . attain and maintain the narrative criteria." The commenters add that the agencies ignore that the water quality criteria for the constituents subject to these draft TMDLs apply only to the protection of Class C and D waterway uses—protection and propagation of fish, shellfish, and wildlife; and protection of human health related to consumption of fish and shellfish. The commenters note that the criteria are not tied to the protection of primary or secondary contact recreation. The commenters suggest that DOEE's invocation of the term "most stringent criteria" is meaningless, because "attainment of that water quality criteri[a] is unrelated to recreational or aesthetic uses and thus says nothing about the protection of such uses." The commenters suggest that nothing in the record shows that DOEE looked into whether the draft TMDLs' numeric criteria protect recreational and aesthetic uses in the District's waterways.

    Response: See Response Essay #10.

48. The commenters explain that they believe DOEE to be continuing to assert, rulemaking after rulemaking, that primary contact recreational uses do not currently take place on the Anacostia, the "illusory truth effect" has no purchase on the many community members that regularly recreate in, on, or along the river. The truth is that the Anacostia is widely used for all forms of recreative activities, including swim events in the Anacostia that DOEE itself issues approves. The commenters note that DOEE would choose not to recognize primary contact recreation as a current use of the Anacostia River is astonishing. The commenters add that under EPA's antidegradation rules, the District is required to protect existing uses. The commenters assert

that DOEE chooses to erroneously omit Class A uses as existing uses in the Anacostia, however, does not change the fact that the entire river is designated for Class A and B uses. In addition to having to issue water quality standards that protect primary contact recreation in the Anacostia River, DOEE's TMDLs must protect the many secondary contact recreation activities that happen on and near the river. The commenters add that DOEE's failure to provide for the protection of the many people that engage in these uses renders the draft TMDLs legally, practically, and morally insufficient.

Response: DOEE does not assert that primary and secondary contact recreation uses are absent from the Anacostia River. In fact, DOEE agrees that the Anacostia River is designated for those uses and has maintained those uses through the District's Water Quality Standards Regulations. A variety of activities may be regarded as forms of primary or secondary contact recreation and therefore, DOEE acknowledges that some of these activities that can be classified as forms of primary and secondary contact recreation occur within the watershed. In addition, DOEE recognizes that the Anacostia is currently used for a range of recreational activities. At this time, a swimming ban still exists for the District's waters; however, there was a rulemaking in 2018 that notes the Director may issue a decision that allows a special swimming event in the Anacostia River.

Regardless, the TMDLs are set at levels necessary to achieve the District's water quality criteria for the TMDL pollutants. The District's water quality criteria for the TMDL pollutants are based upon EPA's recommended criteria, which also take into account any designated uses related to ingestion of water and ingestion of aquatic organisms, including recreation in and on the water (Class A and Class B).

See Response Essay #10.

49. The commenters state that the margin of safety in the draft TMDLs does not take into account any lack of knowledge concerning the relationship between effluent limitations and water quality. This analysis must be included in the final TMDLs in order to comply with this statutory requirement.

    Response: See Response Essay #11.

50. The commenters note that in the 2003 Anacostia TMDLs for organics and metals an explicit 1% margin of safety was applied; however, in these draft TMDLs, this explicit MOS was removed and replaced with an "implicit" MOS, without explanation for the change.

    Response: See Response Essay #11.

51. The commenters explain that implicit MOSs rely on conservative modeling assumptions to account for uncertainty in the TMDLs, instead of applying a percentage of the loads as the MOS. However, some of the conservative assumptions identified in these draft TMDLs are not truly conservative, and there are many non-conservative assumptions in the TMDLs, rending this implicit MOS insufficient.

    Response: See Response Essay #11.

52. The commenters state that the use of the years 2014 – 2017 is not a conservative approach to the years used for modeling because this selection fails to take into account the significant increases in precipitation the DC region is experiencing due to climate change.

    Response: See Response Essays #12 and #14.

53. The commenters state that, in light of the agencies' lack of data, their assumption that point sources are discharging toxic pollutants at criteria levels would only be a conservative approach if these facilities are actually currently discharging toxic pollutants at levels above criteria concentrations. If these facilities are instead discharging at levels below criteria concentrations, this assumption could allow these sources to increase their toxic pollutant discharges. Or if the facilities are indeed currently discharging at criteria concentrations, this assumption would be neither conservative nor liberal.

    Response: See Response Essay #3.

54. The commenters assert that setting non-detect results in the water quality monitoring data at half the detection limits is not necessarily a conservative assumption, and additional information is needed in order to determine whether this is a conservative approach. The commenters add that the draft TMDLs should provide this information in order to clarify whether setting the non-detects at half the detection limits is a conservative assumption.

    Response: The fact that monitoring data returned non-detect results suggests that levels of a pollutant are in fact relatively low. An argument could be made for setting those concentrations at zero. We refer the commenter to the TMDL Modeling Report for added context. Setting the non-detected toxicant value to half detection value allows for calibrating towards a value that is low but greater than zero. In another instance, observed toxicant bed sediment concentrations were used to specify initial run conditions when non-detects were set to half the detection in the hydrodynamic water quality model. This provides for an additional conservative assumption when it is known that the concentration is very low (albeit unknown) but is essentially not zero or the sediment is not clean.

55. The commenters state that the draft TMDLs fail to consider environmental justice.

    Response: See Response Essay #13.

56. The commenters state that the draft TMDLs fail to account for climate change.

    Response: See Response Essay #14. This is a comment relates to the 2021 draft TMDL Report. In response to this and similar comments, DOEE analyzed the TMDL allocations under two projected climate change scenarios and time horizons. That analysis can be found in Section 7 and Appendix B of the TMDL Report.

57. The commenters assert that the draft TMDLs fail to provide schedules for TMDL Assessment or a timeline for achievement of water quality standards.

Response: While the CWA directs that TMDLs be established at a level necessary to implement applicable water quality standards, the CWA and regulations do not specify any particular time period to achieve water quality standards. The time period to achieve water quality standards necessarily will depend upon such factors as the nature of the pollutant, the applicable water quality standards, the nature of the sources, and the nature of the receiving waters. The TMDL Report includes a demonstration that the TMDL allocations are established at levels necessary to achieve applicable water quality standards. See also Response Essay #7.

58. The commenters state that while the draft TMDLs contain much discussion of, and use of the word "daily," they lack any actual daily maximum loads that are clearly allocated to any point sources with the intent of incorporation into permits. The commenters add that calling something a daily value, or even accurately calculating a water segment's capacity to accept or assimilate a maximum daily amount of a pollutant, does not satisfy the TMDL requirements if such loads are not implemented, implementable, or even clearly intended to be imposed through NPDES permits.

Response: See the responses to Comments #25 through 28.

59. The commenters suggest that using anything other than actual maximum daily loads for what the river segments can take and what the sources can release on any given day means that there could be water quality violations on some days that are obscured by averaging or lack of monitoring and restrictions. The commenters note that while there could be some parameters and situations where true daily maximum loads and limits are not possible or appropriate, that does not appear to be the case for the parameters and conditions associated with these TMDLs.

Response: See the responses to Comments #25 through 28.

60. The commenters state that all point sources that contribute, or could likely contribute, pollutants at issue must be included in the analyses and wasteload allocation ("WLA") component. This includes stormwater permits for sites and land areas covered by the regulations. While the draft TMDLs correctly describe regulated stormwater as point sources, they then inconsistently and incorrectly treat them as non-point sources ("NPSs") by failing to actually assign any portion of the loading capacity of the water segments to these permits.

Response: DOEE disagrees with the premise of this comment. The point sources of toxic pollutants to the Anacostia River watershed identified in the TMDL development process are described in Section 3.2 of the TMDL Report. All point sources that were identified to contribute toxic pollutants to the system, including regulated stormwater, were assigned WLAs in these TMDLs.

61. The commenters state that when assigning loads to sources in the WLA process for a given water segment, it makes the most sense to clearly allocate through individual permits and specific outfalls. The commenters add that in some limited instances it may be reasonable to allocate loads through general permits, but this easily becomes vague, confusing, and non-site specific, especially if there is no clear plan to enforce such loads with numeric limits in those permits that are based on daily maximum allowable loads.

Response: See the responses to Comments #25 through 28 and #35.

62. The commenters state that a careful reading of both the TMDL and permit regulations shows that for permits impacting water quality limited segments, the discharge of pollutants for which the waters have limited capacity can only be allowed within the bounds of available loading capacity ("LC") – the ability of a water segment to absorb or assimilate an amount of a pollutant at issue on a daily maximum basis without violating water quality standards. The commenters continue that such allowances or allocations (WLAs) must be the basis for the required water quality based effluent limits (WQBELs) that are to be calculated from the LCs. In this complex situation with the Anacostia TMDL, I do not see how general permits can be legitimately used.

Response: See the responses to Comments #25 through 28 and #35.

63. The commenters state that an early EPA guidance in 2002 suggested that WLAs for stormwater could be aggregated into a single value for all discharges, and then effectively not implemented except through vague best management practices ("BMPs") and voluntary efforts. The commenters claim that this flawed analysis was later retracted by EPA in 2010, and again in 2014 with direction to correctly allocate loads individually in keeping with the TMDL requirements.

Response: See the responses to Comments #25 through 28.

64. The commenters state that even if disaggregated into individual pollutant loads for each permit – stormwater and otherwise – the TMDLs' intent and requirements cannot be met if there is no enforceable implementation. The commenters suggest that assigning a load number to a permitted source and then hoping for attainment through voluntary programs and BMPs is not sufficient. The commenters add that BMPs are defined as controls for NPS, not permitted point sources, or only where effluent limits are not possible, which is not the case here. The commenters state that aggregating some or all loads for multiple sources, outfalls, or permits for a given pollutant, such as for heptachlor epoxide in Maryland or the WLAs for all Multi-Sector General Permit facilities in the District, is not in keeping with the WLA component of the TMDL requirements.

Response: See the responses to Comments #25 through 28 and #35.

65. The commenters state that the TMDL law and regulations call for first determining the LC. The commenters state that water quality standards include three components: 1) uses, 2) criteria (numeric or narrative), and 3) antidegradation (or the prohibition on lowering existing water quality, even if at a level better than just barely meeting criteria). The commenters add that TMDLs are then required for waters identified as needing more than the minimum mandated technology-based controls to meet or maintain water quality standards.

Response: The TMDLs satisfy applicable statutory and regulatory requirements and are set at levels sufficient to implement applicable water quality standards. Note: in this comment the commenters use the abbreviation LC to represent loading capacity.

66. The commenters state that regulations for NPDES permits clearly state that loads and limits can only be given in keeping with available loading capacity of TMDLs (see 40 CFR 122.4(i) and 122.44(d)). The commenters state that if all of the LC is taken up by existing pollution, then

permittees cannot simply be given an allocation that is not there to give. The commenters add that allowing dischargers to keep existing permit limits (especially limits not based on any TMDL), or given criteria as limits, given limits on hoped for future improvements, or even given no limits at all, is not in keeping with the TMDL requirements.

Response: See Response Essays #3 and #9.

67. The commenters state draft TMDLs state that for many permitted dischargers and parameters at issue, there is no monitoring data for current levels of discharge. The commenters state that as such, the draft TMDLs assume that point sources have been discharging at current numeric criteria concentrations (except for PAH1), and that more contaminated point sources only need to be "reduced" to criteria concentrations. The commenters assert that this plan is neither logical nor conservative. The commenters add that this is based on a lack of knowledge of current levels of discharges, and after more than eleven years of time to gather needed data, a failure to even ask (or require) dischargers to monitor so as to be able to develop sound TMDLs. The commenters suggest that if lower levels of pollutants are currently being discharged at some outfalls for some or all pollutants, this setting of point source reductions to criteria concentrations allows an increase of pollution under the TMDLs. The commenters also suggest that for point sources that are currently discharging at levels above criteria concentrations, if there is currently no available capacity (LC) in the receiving waters due to NPSs and other sources, this reduction only to criteria concentrations doesn't require any further reduction by dischargers to the more stringent levels needed.

Response: See Response Essay #7.

68. The commenters state that requiring permitted sources to comply with criteria levels in their discharges seems to suggest that this will somehow result in the receiving waters someday, somehow achieving in-stream levels of pollutants equal to or better than criteria. The commenters suggest that such assignments of water quality criteria as reductions or discharge levels in the TMDL analysis are not WLAs.

Response: See Response Essay #7.

69. The commenters state that the draft TMDLs do not provide any reasonable assurances that source reductions will realistically occur and lead to achievement of water quality standards in a meaningful timeframe. The commenters suggest that initial reductions provided are vague, and watershed loading reductions seem to just be numbers without any identification of how to achieve the reductions other than generalities of BMPs (which are not even applicable in many cases), and on-going and voluntary programs. The commenters add that when those assumptions were determined to not be adequate, more vague, unrealistic, and unenforceable reductions of land use loadings and legacy pollution were factored in to reach the desired goals at some point in the future – even a hundred years in some cases – largely by natural disappearance (or "attenuation").

Response: See Response Essay #8.

70. The commenters state that existing contaminated sediments in the river were not accounted for as background, thus reducing available LC, but rather assumed to just go away some day, with

currently unavailable loads incorrectly allocated now, as if such are available. The commenters add that it is hard to tell if the natural removal hopes for the sediment are based on decay, or a reduction in input by some unspecified means or timeframe of implementation. The commenters state that it is unclear how much of the LC is currently being taken up by the contaminated sediments, or if in some cases it currently accounts for the entire LC.

Response: See Response Essays #6 and #7.

71. The commenters state that many sources of inputs are shown as having a proposed 90 to 100% reduction. The commenters state that it is not explained how this will happen or is even possible with unregulated sources. The commenters suggest that without some explanation of how and when WLAs will be implemented through permitted sources, the timeframe for attainment is open ended.

Response: See Response Essays #8 and #9.

72. The commenters state that the DC Long Term Control Plan (CSO reductions), and the 2016 DC TMDL Consolidated Implementation Plan have been in place, at least in part, for years, and have apparently not been working thus far. The commenters assert that citing this and continued reliance on it for improvements has no basis in reality.

Response: See Response Essay #8. The DC Long Term Control Plan has, in part, been in operation since March 2018. Through early December 2019, D.C. Water reported that the Anacostia River Tunnel System removed 90 percent of the combined sewer overflow that would have otherwise entered the river. The Northeast Boundary Tunnel project, which was recently completed in September 2023, will remove additional CSOs from entering the Anacostia River. It is anticipated that combined sewer overflows will be reduced by 98 percent, which is expected to achieve significant reductions in the toxic loads from the CSS.

73. The commenters suggest that reliance on the Anacostia Rivers Sediment Project to support reasonable assurance of success is misplaced as it does not appear to have been considered in the TMDL development. The commenters state that it is not apparent if or how it will impact the models or the pollutant levels. The commenters state that there is currently only an interim record of decision that is focused on “early action areas” or “hot spots” for PCB pollution. The commenters add that that effort is focused on PCBs, and though chlordane is associated, it doesn’t mean that, even if successful for reducing PCBs, it is known if it will result in reductions of any or all of the TMDL target pollutants.

Response: See Response Essays #3, #6 and #8.

74. The commenters state that the draft TMDLs claim to have an adequate margin of safety (“MOS”) based on various “conservative assumptions”. The commenters add that simply stating some conservative assumptions, or that some assumptions are conservative, does not make it adequate or so, nor make up for the overwhelming non-conservative assumptions upon which these draft TMDLs are based.

Response: See Response Essay #11.

75. The commenters assert that many unreasonable, unrealistic, or non-conservative assumptions dominate the draft TMDLs. The commenters list that these include vague reference to "land use reductions", reliance on general permits with no limits, lack of monitoring, assumption of current point source discharges not exceeding criteria, and years or even decades of hoped for natural attenuation of sediment while allocating loads that currently do not exist to allocate. The commenters state that in order to determine whether setting the non-detects at half the detection limits is conservative or not, the draft TMDLs should clarify what detection limits were used, what quantification or reporting limits were used, and whether the "detection limit" referred to is actually a "quantification limit." The commenters add that assuming discharges at half of the quantification limit might be conservative, using half of the detection limit likely is not. The commenters state that it is also unclear if sewage treatment discharges are being accounted for at maximum flows and at daily maximum loads, or at some lesser average levels or limits.

    Response: The comment appears to conflate the concept of conservative assumptions as used in connection with margin of safety and with consideration of whether certain voluntary or nonvoluntary measures provide reasonable assurance. See Response Essays #8 and #11. If the reference in the comment to discharges from wastewater treatment plants in District waters, the Blue Plains wastewater treatment plant discharges to the Potomac River, not the Anacostia River. If the comment refers to discharges from wastewater treatment plants in Maryland, the TMDL establishes a boundary condition that appropriately accounts for pollutant loads reaching District waters from Maryland. See Response Essay #5.

76. The commenters suggest that the four years of 2014 through 2017 used for modeling may be an adequate length of time, but it is not explained if this is typical of all years on record or expected. The commenters state that if there are extreme weather or flow events - or lack thereof - in this time period that donot account for future expected conditions, that needs to be accounted for by additional MOS or other adjustments. The commenters add that, indeed, rainfall in 2018 was approximately double the amounts in 2016 and 2017, and approximately a third greater than the amounts in 2014 and 2015. Additionally, the commenters state that as climate continues to change it can be expected that conditionsimpacting the TMDLs will change, such as temperature, flow, and runoff. The commenters state that there is no indication that the TMDLs accounted for climate change in any way.

    Response: See Response Essay #12.

77. The commenters suggest that the draft TMDLs are rather vague on when and how progress and success will be measured. The commenters add that they rely heavily on assumptions that other programs, non-regulatory efforts, and natural attenuation will someday result in waters meeting standards. Further, the commenters state that there has been a lack of monitoring to date for some of the dischargers, with no stated plans to change that. The commenters state that some post-TMDL fish tissue monitoring is planned, but more is needed now and after the TMDLs are finalized, including at least annual sediment testing to measure if natural removal is actually taking place or conditions are becoming worse and adjustments in modeling, assumptions, or implementation are needed.

    Response: See Response Essays #3 and #8. In Section 9.5 of the TMDL Report, DOEE commits to post-TMDL monitoring. The results of these post-TMDL monitoring efforts will be used to monitor and track progress toward attainment of the TMDL endpoints and, therefore, the water quality standards and associated designated uses. In addition, the ARSP will conduct monitoring and will help DOEE determine progress towards improving water quality (See Section 9.4 of the TMDL Report).

78. The commenters state that the draft TMDLs do not contain a timeline for compliance with water quality standards other than the table of years for natural attenuation, which implies overall achievement of standards. The commenters add that that implication of compliance is far from clear, and the timeframes for some waters and parameters are unreasonably long.

Response: See Response Essay #7.

79. The commenters state that no plans are stated for alternative actions if short term monitoring fails to confirm the assumption that loads are decreasing are actually occurring and that assumptions were neither valid nor conservative.

Response: In Section 9.5 of the TMDL Report, DOEE commits to post-TMDL monitoring and acknowledges that the effectiveness of the implementation effort will need to be reevaluated throughout the process to ensure progress is being made towards reaching the TMDLs. For additional information, see DOEE's 2022 TMDL Consolidated Implementation Plan developed for the MS4.

80. The commenters explain that they found the draft TMDL difficult in places to follow in terms of the methodology and the expression of the proposed final annual and daily TMDL values, WLAs and LAs. The commenters suggest that a generalized effort to present a more practical discussion of these methodologies and expressions would benefit all of the parties and, especially, the public.

Response: DOEE acknowledges that the TMDL Report is lengthy and technical in nature. This TMDL Report covers ten different pollutants/pollutant groups and 13 impaired waterbody segments in the Anacostia River watershed. In addition, the TMDL pollutants are present in the environment primarily due to historical activities, and most are no longer applied or used actively. For these reasons, this TMDL Report must detail an inherently complex and technical set of TMDLs. Efforts have been made to be as clear as possible. For more detailed description of the modeling effort, see the TMDL Modeling Report.

81. The commenters ask that the draft TMDL be updated to assign one waste load allocation to the combined sewer system.

Response: The TMDL does assign one wasteload allocation to the combined sewer system, with the exception of Outfall 019, which has a separate wasteload allocation.

82. The commenters explain that the Blue Plains WWTP does not discharge to the Anacostia River. The NPDES permit issued to D.C. Water authorizes discharges from WWTP and the wastewater system, which includes the CSS. If Blue Plains WWTP is identified in the Draft TMDL to represent CSO 019 only, please note that there are two CSOs at this location per the NPDES permit. One

outfall is CSO 019, which is the existing discharge for the Northeast Boundary Drainage area. The other outfall is CSO 019a, which is the overflow from the Anacostia River Tunnel. The draft does not appear to refer to outfall 019a, which is the most relevant of the two discharge points.

Response: See Response Essay #4 and #11.

83. The commenters note that the TMDL indicates that CSO 019 "used to discharge to the Anacostia." Both CSO 019 and 019a remain active and may discharge when the capacity of the tunnel system is exceeded.

    Response: See Response Essay #4 and #11.

84. The commenters ask for confirmation that the loads assigned to "CSS" represent all remaining CSOs as follows: CSOs 005, 007, 009, 011, 011a, 012, 013, 014, 015, 016, 017 and 018.

    Response: The WLA assigned to the combined sewer system (CSS) does in fact represent all combined sewer outfalls, including those identified in Comment #85 and Outfall 019a. See Response Essay #4.

85. The commenters request that one, joint WLA be assigned to these CSO discharges rather than allocating the WLA for each CSO. Given the interconnection provided by the tunnel, the CSOs act as a system and differentiating loads between outfalls is not consistent with system operation or performance. The TMDL modeling report correctly indicates that all CSOs discharge into the same river segment (Anacostia1) and, as a result, there should not be a load differentiation between the discharges.

    Response: See response to Comment #84 and Response Essay #4.

86. The commenters also explain that they we are not aware of a practical or regulatory reason or basis for a differentiation between 019, 019a and the other CSO outfalls. The underlying drivers of the TMDL are the instream designated use listed impairments for ten water quality parameters. It appears that in all of the pollutant/receiving water combinations addressed by those listings, the affected use is human health, based on consumption of fish and shellfish. Draft TMDL Table 1-1. The Draft TMDL Report further correctly notes that the relevant water quality duration component for these criteria is the 30-day average concentration, citing to the D.C. water quality standards regulations. Considering the 30-day factor and the ebb and flow of the affected waterways, the overall discharge of the relevant pollutant parameters from all the CSO outfalls is what is important for water quality purposes, and any division of pollutant parameter mass between the two (or any other number of) discharge points is simply not relevant. Therefore, the commenters ask that a single WLA be included for all CSOs.

    Response: Please refer to the response to Comment #84 and Response Essay #4. For a description of how the TMDLs are set at levels necessary to meet all applicable water quality standards, see Response Essay #10.

87. The commenters suggest that WLAs assigned to CSO appear to be Inadequate for Some Parameters. In addition, the commenters include supporting language and calculations to support this comment. Ultimately, the commenters request that that WLAs for the CSO be

increased to match those estimated by the commenters in this manner for the LTCP system performance.

Response: The WLAs assigned to the CSS are designed to achieve applicable water quality standards instream and are based on modeled toxic pollutant loads from the CSS to the Anacostia River. Overflow relationships were developed that replicate conditions where CSS reaches discharge only during significant rainfall events. These overflow relationships were developed to determine combined sewer overflow (CSO) during substantial rainfall events. Toxic pollutant concentrations were then assigned to overflows based on simulated in-stream concentrations. Using these estimated baseline conditions for the CSS and other point and nonpoint sources, a TMDL scenario was developed by reducing pollutant loads to achieve the applicable TMDL endpoints through an iterative process. Therefore, the WLAs and LAs presented in the TMDL Report are set at levels that are necessary to achieve the TMDL endpoints and therefore, the applicable water quality criteria in the Anacostia River, its tributaries, and Kingman Lake.

DOEE has reviewed the calculations provided by the commenter regarding this subject. Overall, the comments do not provide information demonstrating that the allocations provided by the commenter are at a level necessary to implement the applicable water quality standards, and it appears the commenter has failed to consider the applicable water quality standards in these calculations. Section 303(d) of the Clean Water Act directs that a total maximum daily load be established at a level necessary to implement the applicable water quality standards.

In addition, the commenter used 1988-1990 rainfall data in the calculations, whereas rainfall and other atmospheric data from 2014-2017 were used in the modeling for these TMDLs. Also, the commenter utilized observed event mean concentrations to calculate loads for arsenic, copper, and zinc. Finally, the commenter utilized reporting limits to calculate loads for the organochlorine pesticides and PAHs that were much higher than applicable water quality criteria.

Pollutant	**D.C. Water Reporting Limit (ng/l)**	**WQC (ng/L)**
Chlordane	1,000	0.32
DDT	300	0.018
Heptachlor Epoxide	50	0.032
Dieldrin	100	0.0012
PAH 2	10,000	1.3
PAH 3	10,000	0.13

88. The commenters suggest that CSOs should not be assigned a WLA of zero.

Response: The CSS is not assigned a WLA of zero. However, for certain pollutants, the WLAs assigned to the CSS are so small that mathematical rounding led to “0” being presented within the TMDL allocation tables.

In many cases, the TMDL pollutants exist in very low concentrations in the environment based on limited site-specific data. Despite these low existing concentrations, estimated modeled concentrations account for uncertainty. The WLAs assigned to the CSS are set at levels that are necessary to achieve the TMDL endpoints and therefore, the applicable water quality criteria in the Anacostia River and its tributaries, taking uncertainty into account and with a margin of safety.

89. The commenters request that a basis for the CSO loads be included in the TMDL. In addition, the commenters ask that the annual and maximum daily CSO volume, and pollutant concentrations in the CSO discharges used in the development of the Draft TMDL should be provided for comparison to LTCP predictions.

    Response: To calculate estimated CSS TMDL pollutant loads, custom FTABLES (function tables in the TMDL watershed model (LSPC)) were developed for sewer lines that are part of the District CSS. The function tables describe the relationship between water depth, surface area, water volume, and outflow in the segment. The CSS FTABLES were used to define storage overflow relationships that replicate conditions where CSS reaches only discharge during significant rainfall events. The FTABLES were developed using information provided by D.C. Water such that during LSPC model setup, those tables were used as a guide in setting up the CSO volumes in the LSPC model. The information provided by D.C. Water included overflow estimates for the 2012-2015 time period. Please refer to the TMDL Modeling Report for an explanation of how the CSS loads were determined. See also the response to Comment #7.

90. The commenters write that none of the TMDLs should be derived based, in whole or in part, on aquatic life criteria for copper or zinc.

    Response: EPA regulations at 40 CFR § 130.7(c)(1) state that TMDLs shall be established at levels necessary to attain and maintain the applicable narrative and numerical water quality standards. Water quality standards are comprised of three components: (1) designated uses, (2) criteria necessary to protect those uses, and (3) antidegradation provisions that prevent the degradation of water quality. The waters addressed by these TMDLs are designated for, among others, the “protection and propagation of aquatic life” and “fish consumption” designated uses, and DOEE has adopted numeric criteria for the TMDL pollutants to protect those uses. TMDLs for a pollutant must be protective of all designated uses, regardless of whether the waterbody is impaired for a particular use. For this reason, the most stringent numeric criterion applicable to a particular pollutant was selected as the TMDL endpoint, as it will protect all other uses. See also Response Essay #10.

91. The commenters ask that the TMDL be linked to the climate period used for TMDL development. The commenters provide average annual rainfall data from 2014-2017 and explain that the years have comparatively average rainfall and do not account for wetter years which may cause an increase in loads. The commenters ask that language be included tying the TMDL WLAs to the climate period used to develop it.

    Response: See Response Essay #12.

92. The commenters suggest that the daily loads in the revised draft TMDLs must be implemented via individual Clean Water Act numeric limits. The commenters explain that they strongly support the addition of daily wasteload allocations and load allocations assigned to sources of

pollution in these revised draft TMDLs, as required by the Clean Water Act. In order to ensure implementation of these daily loads for point sources, however, the loads must be included in individual Clean Water Act permits, or individual addenda to the general permit requiring individual numeric limits. While incorporation of wasteload allocations into individual permits is straightforward for the point sources that are already individually permitted (Super Concrete Corporation, D.C. Water, PEPCO, and Washington Navy Yard), the task is more complicated for stormwater point sources covered by the District Municipal Separate Storm Sewer System ("MS4") permit or the Multi-Sector General Permit ("MSGP").

Response: The inclusion of daily WLAs and LAs assigned to individual sources of pollution represents a significant revision that DOEE made between the 2021 and 2023 drafts.

How the wasteload allocations in these TMDLs will be implemented through NPDES permit terms and conditions is beyond the scope of these TMDLs. DOEE notes that EPA is the NPDES permitting authority for the District of Columbia. Per 40 CFR § 122.44(d)(1)(vii)(B), effluent limits shall be consistent with the assumptions and requirements of any available wasteload allocation for the discharge.

93. The commenters explain that the District MS4 permit provides coverage for point source discharges of stormwater from or through the District MS4 to waters of the United States. While the currently proposed draft MS4 permit for the District includes some numeric limits in the form of the number of acres "managed" to a specific level of stormwater retention, as well as some additional numeric requirements such as planting a specific number of trees and performing specific amounts of street sweeping and trash removal, the draft permit does not include numeric limits for any individual pollutants at MS4 outfalls. In order for the daily wasteload allocations assigned to the MS4 system to be implementable, the MS4 permit must require monitoring and numeric effluent limits for the pollutants at issue in these draft revised TMDLs. These draft revised TMDLs must accordingly require implementation of the daily wasteload allocations for the MS4 system via numeric permit limits in the MS4 permit. Without such a requirement, the daily wasteload allocations for the MS4 system would have no mechanism for implementation. While the revised draft TMDLs correctly note that the MS4 program includes a "TMDL implementation plan," this plan does not include enforceable numeric limits at outfalls consistent with the assigned wasteload allocations. Instead, the plan includes "initiatives throughout the District to reduce stormwater runoff," including the regulatory requirement for new development and redevelopment projects in the District to manage their area retain at least 1.2 inches of stormwater. Because toxic pollutants bind to sediment and are transported to the Anacostia during rain events, it is assumed that these general stormwater reduction measures will reduce the levels of the pollutants at issue in these TMDLs. But even if some reductions of the pollutants at issue occur, these laudable stormwater reduction initiatives simply cannot ensure that the specific wasteload allocations assigned to the MS4 are being achieved. Without a mechanism to monitor and numerically limit the levels of the TMDL pollutants at MS4 outfalls, the MS4 permit cannot demonstrate achievement of the wasteload allocations.

Response: See the response to Comment #92.

As noted in the response to Comment #92, how the wasteload allocations in these TMDLs are implemented through NPDES permit terms and conditions is beyond the scope of these TMDLs. That said, as the comment correctly explains, DOEE develops a Consolidated TMDL Implementation Plan as part of the District of Columbia MS4 permit requirements. The latest version of this plan was finalized in September 2022.

The MS4 permit for the District of Columbia was reissued on November 20, 2023. This permit contains specific deadlines for compliance, incorporates clear performance standards, and includes measurable goals and quantifiable targets for implementation.

94. Because stormwater permittees often have a large number of outfalls with high variability in pollutant loading, monitoring requirements at outfalls for specific pollutants may not be effective in addressing pollution and attaining water quality goals. Alternatively, stormwater permits often use a combination of best management practices (BMPs), as opposed to numeric effluent limitations, to achieve their prescribed WLAs. The permit may specify actions that the permittee must take if the BMPs are not performing properly or meeting expected load reductions. When developing monitoring requirements, the NPDES authority should consider the variable nature of stormwater as well as the availability of reliable and applicable field data describing the treatment efficiencies of the BMPs required and supporting modeling analysis. Similarly, the commenters explain that the daily wasteload allocations assigned to industrial stormwater sources covered by the MSGP must be implemented through individual NPDES permit limits, either via individualized addenda or individualized permits. Commenters strongly support the revision in these draft TMDLs that provides individual maximum wasteload allocations for sources covered by the MSGP. However, the revised draft TMDLs do not contemplate any monitoring or implementation of these individual wasteload allocations at the discharging facilities, and instead simply provide that facilities will be considered in compliance with the TMDLs provided their discharges are not "at levels that have a reasonable potential to cause or contribute to an exceedance of water quality criteria." But whether an individual facility is causing or contributing to exceedances of water quality criteria is not determinative of whether that facility is exceeding its assigned maximum daily loads. In order to implement the maximum daily loads at these facilities, the facilities must be subject to effluent limits for these wasteload allocations via individualized permit limits.

Response: See the responses to Comments #92 and #93.

How the wasteload allocations in these TMDLs will be implemented through NPDES permit terms and conditions is beyond the scope of these TMDLs. That said, DOEE notes that the current MSGP became effective on March 1, 2021. There are two provisions in the MSGP that relate to dischargers to impaired waters with a TMDL.

First, MSGP Permit Part 2.2.2.1 states:

> "If [a permittee] discharge[s] to an impaired water with an EPA-approved or established TMDL, EPA will inform [the permittee] whether any additional measures are necessary for [their] discharge to be consistent with the assumptions and requirements of the

> applicable TMDL and its wasteload allocation, or if coverage under an individual permit is necessary per Part 1.3.8."

Second, MSGP Permit Part 4.2.5.1.b states:

> "For stormwater discharges to waters for which there is an EPA-approved or established TMDL, [the permittee is] not required to monitor for the pollutant(s) for which the TMDL was written unless EPA informs [the permittee], upon examination of the applicable TMDL and its wasteload allocation, that [the permittee is] subject to such a requirement consistent with the assumptions and findings of the applicable TMDL and its wasteload allocation. EPA's notice will include specifications on stormwater discharge monitoring parameters and frequency."

95. The commenters state that the revised draft TMDLs' wasteload allocations for individually permitted sources are largely not based on monitoring data. The commenters state that in order to develop accurate wasteload allocations that assign a portion of the necessary pollution reductions to point sources, states must first determine how much pollution point sources are currently discharging. For these revised draft TMDLs though, the District admitted it has no data on the amount of toxic pollutants most of the individually permitted point sources are discharging, despite the District's individual NPDES permits requiring the collection of at least some TMDL monitoring data. And even with the passage of two years since the publication of the initial new draft TMDLs in 2021, this monitoring data for the vast majority of the toxic pollutants emitted by permitted point sources has apparently still not been collected and utilized for the development of these TMDLs. The District has acted arbitrarily and unlawfully in failing to collect and use this fundamental data in the thirteen years the District has had to develop these court-ordered TMDLs, especially when the 2003 TMDLs outline four specific steps for collecting this monitoring data from individually permitted point sources, and when the District's individual permits already largely require some sampling for the pollutants subject to these TMDLs.

    Response: DOEE disagrees that it has acted unlawfully or that it has been arbitrary or capricious in establishing these TMDLs. See Response Essay #3.

96. The commenters state that instead of collecting and using the relevant monitoring data, the District assumed without knowing that individually permitted point sources are currently discharging toxic pollutants at criteria concentrations, with the exception of copper and zinc at PEPCO. But in reality, these point sources could currently be discharging at levels above criteria concentrations or below criteria concentrations. This uncertainty is problematic because it means that any assigned wasteload allocations could actually allow increases in pollution discharges instead of reductions, or could allow stagnant pollution discharge levels. Given the unreliability of hoped-for nonpoint source reductions, it is critical that actual reductions be required at all point sources, especially individually permitted point sources, in order to assure some level of total reductions under these TMDLs. Actual reductions from individually permitted point sources simply cannot be ensured without baseline monitoring data regarding current discharge levels.

    Response: See Response Essay #3.

97. The commenters state that the revised draft TMDLs fail to provide reasonable assurances that source reductions will occur and will lead to achievement of water quality standards, and therefore the revised draft TMDLs must be modified to maximize point source reductions.

    Response: See Response Essays #8 and #9.

98. The commenters explain that TMDLs that set wasteload allocations based on the assumption that nonpoint source reductions will occur must provide “reasonable assurances” that the reductions will actually occur. The commenters state that the Clean Water Act requires a TMDL to set water quality-based effluent limits for all point sources for the pollutants at issue. Under 40 C.F.R. §130.2(i), “[i]f Best Management Practices (“BMPs”) or other nonpoint source pollution controls make more stringent load allocations practicable, then wasteload allocations can be made less stringent.” In order to allow less stringent wasteload allocations, EPA has determined that: when a TMDL is developed for waters impaired by both point and nonpoint sources, and the WLA is based on an assumption that nonpoint source load reductions will occur, the TMDL must provide ‘reasonable assurances’ that nonpoint source control measures will achieve expected load reductions in order for the TMDL to be approvable. EPA’s guidance explains: “Where there are not reasonable assurances, under the [Clean Water Act], the entire load reduction must be assigned to point sources.”

    Response: See Response Essays #8 and #9.

99. The commenters state that rather than run model scenarios that maximize point source reductions, the revised draft TMDLs largely rely on significant nonpoint source reductions, 64 percent of which are more than 98% reductions (and many of which are 100% reductions). The revised draft TMDLs do not explain how these complete or near-complete eliminations of nonpoint source pollution will occur, or are even possible without permits or regulations.

    Response: See Response Essay #9.

100. The commenters state that the revised draft TMDLs contain no implementation plan and point to only vague hopes of implementation through “best management practices” and pollution programs that were not modeled and that have mostly been in place for years without achieving the necessary reductions. These hoped-for, unquantified assumptions of efficacy do not constitute reasonable assurances of reductions, and EPA has previously rejected similar offerings of reasonable assurances in TMDLs, even when an implementation plan was included in the TMDL, which was not the case here.

     Response: See Response Essays #8 and #9.

101. The commenters suggest that the revised draft TMDLs concede that even if these unrealistically high nonpoint source reductions are achieved, water quality standards would still not be attained during dry weather conditions without including some other reductions in the model. In order to model attainment of water quality standards during dry weather, the modelers had

to factor in the “natural attenuation” of toxic pollutants in sediment, meaning that even if all of the hoped-for reductions in point source and nonpoint source pollution occur, water quality standards will not actually be achieved until these toxic loads naturally decrease over many years, sometimes a hundred or more years. The revised draft TMDLs accordingly consist largely of unenforceable and unrealistic nonpoint source reductions and a wait-and-see approach to the natural disappearance of sediment contamination.

Response: See Response Essays #3 and #9.

102. The commenters state that in addition to the natural attenuation of contaminated sediment, the revised draft TMDLs identify a number of pollution reduction programs that DOEE hopes will reduce toxic pollution, none of which were modeled to determine their impacts on these TMDLs, and most of which have been in place, at least in part, for multiple years without achieving compliance with toxic pollutant water quality criteria.

Response: See Response Essay #8.

103. The commenters explain that an example related to their previous comment is the cited Chesapeake Bay Agreement was signed in 2014 and is a voluntary, multi-jurisdictional agreement among six states and the District that outlines eleven broad “goals” for the Bay. The toxic pollution goal is to “[e]nsure that the Bay and its rivers are free of effects of toxic contaminants on living resources and human health.” There are no binding commitments in this agreement, nor plans for how to achieve these broad, vague goals. The revised draft TMDLs provide no explanation of how this voluntary, nine-year-old agreement will suddenly reduce toxic pollutant levels to a point where the Anacostia River watershed will attain applicable water quality standards.

Response: See Response Essay #8.

104. The commenters provide an additional example that the draft TMDL report cites the Anacostia River Sediment Project as an example of why the modeled nonpoint pollution loads will be achieved. However, this project also was not factored into the modeling. The revised draft TMDLs provide no data regarding if or how the project will impact the models or the levels of the pollutants that are the subject of these TMDLs. Moreover, the sediment project is focused on PCB pollution – a pollutant not subject to these TMDLs. The revised draft TMDLs claim that the PCB remediation “is also expected to reduce other pollutants . . . that coexist in the PCB-contaminated sediment,” but provide no data or support for that claim. Finally, there is only an interim record of decision for the project that is focused on “early action areas” or “hot spots” for PCB pollution. It is unclear when these PCB hot spot cleanups will take place, or when a final record of decision will be made. For all of these reasons, the effects of the project on the TMDL toxic pollutants are uncertain and speculative.

Response: See Response Essays #6 and #8.

105. The commenters also explain that TMDLs cite the 2016 and 2022 Consolidated TMDL Implementation Plans, the combined sewer overflow Long Term Control Plan, and various voluntary programs, MS4 control measures, and best management practices as evidence of reasonable assurances. But the 2016 and 2022 Consolidated TMDL Implementation Plans are necessarily based on the 2003 organics and metals TMDLs, and have apparently not achieved compliance with toxic water quality criteria in the years they have been in place. The revised draft TMDLs do not explain why these consolidated plans will assure compliance with these new draft TMDLs. The combined sewer overflow Long Term Control Plan, for its part, has thus far resulted in the completion of two combined sewer storage tunnels impacting the Anacostia. While these tunnels and future tunnels and combined sewer overflow control measures will presumably reduce toxic pollutants to the extent they are present in combined sewer overflow, the revised draft TMDLs do not model or quantify any reductions. Finally, vague references to voluntary programs or MS4 permit terms do not explain why the specific and significant numeric reductions called for in the revised draft TMDLs will be achieved.

Response: See the response to Comment #35.

106. The commenters state that the planned monitoring measures, while a start, also fail to provide reasonable assurances that modeled reductions will be achieved. The revised draft TMDLs state that the District measures toxic pollutants in fish tissue approximately every two to three years, and completed a study in summer 2023. This sporadic monitoring, however, is used only to determine use support for Class D waters and to develop fish consumption advisories as needed. Accordingly, it is unclear how the fish tissue monitoring will be used to assess progress towards achievement of the TMDL endpoints. Similarly, the revised draft TMDLs note that DOEE will be conducting monitoring for a limited number of pollutants as part of the Anacostia River Sediment Project. While this monitoring is important, DOEE has not explained how this limited set of sediment monitoring data, which does not cover most of the pollutants subject to these TMDLs, would allow DOEE to track the achievement of the TMDL endpoints here.

Response: First, the monitoring of toxic pollutants in fish tissue is not accurately described by the commenter. This monitoring is not sporadic, but routine and consistent. Such fish tissue studies have been completed by DOEE in 2014, 2018, and 2023. The goal of this monitoring effort is to determine if safe fish consumption is supported within the District, which is also the primary goal of these TMDLs since the most stringent TMDL endpoints are based on Class D water quality criteria for most of the TMDL pollutants. The best way to assess whether progress is being made towards achieving the goals of the TMDLs is to continue to monitor fish tissue and, therefore, the associated designated use. In addition, assurance is provided because increased monitoring of fish tissue for toxics will occur as part of the ARSP. A proposed strategic approach for baseline and performance monitoring are currently being reviewed. The approach includes on-going monitoring of game and forage fish and surface and pore water. Feasibility of more frequent monitoring is also being evaluated. It is designed to inform more frequent and regular fish consumption advisories and will include an extensive list of toxic pollutants. See also Response Essay #8.

107. The commenters assert that DOEE must provide reasonable assurances or reassign the entire load reduction to point sources. In order to include nonpoint source reductions in the revised

draft TMDLs, DOEE must point to something new or different, above and beyond the measures the community and nonpoint sources have been implementing for years, and specifically must show how the nonpoint sources will actually be reducing toxic pollutants to the level necessary to comply with the TMDLs. If DOEE cannot make those specific assurances, it must assign the entire load reduction to point sources.

Response: See Response Essays #8 and #9.

108. The commenters state that the revised draft TMDLs do not demonstrate compliance with all applicable water quality standards. The TMDLs are legally deficient and arbitrary because the agency has failed to assure that they are adequate to protect all of the agency's approved water quality standards, including all applicable numeric standards, narrative standards, and designated uses. The commenters state that DOEE incorrectly assumes that numeric limits will attain narrative standards for Class C & D waterways. DOEE assumes that, because the revised draft TMDLs implement "the most stringent WQC in the District's WQS regulations," attainment of the numeric criteria will also "attain and maintain the applicable narrative criteria." DOEE cannot make this assumption. First, DOEE can only rely solely on the numeric criteria if they are the "most stringent *available*," not if they are merely the most stringent currently codified. Under DOEE's reading, the District could satisfy its obligation by relying upon a wholly inadequate numeric criterion, so long as it is the most stringent in its regulations.

Response: See Response Essay #10.

109. The commenters state that DOEE cannot punt its duty to explain why it has satisfied the narrative criteria by referencing EPA's nationally recommended Human Health Ambient Quality Criteria. These criteria were published by EPA in 2015—over eight years ago. DOEE's uncritical reliance on EPA's recommended criteria is not enough to show that the revised draft TMDLs implement the most stringent criteria available.

Response: See Response Essay #10.

110. The commenters suggest that DOEE's assumption is also undermined by the District's own water quality standards regulations. As those regulations state, "EPA has not calculated [numeric] criteria" for both Class C and D uses for some constituents that are the subject of these draft TMDLs, including certain polycyclic aromatic hydrocarbons ("PAHs"). Instead, "permit authorities will address these constituents in NPDES permit actions using the narrative criteria for toxics." Lacking numeric criteria for some uses for constituents such as certain PAHs, DOEE cannot logically assume that attainment of the numeric criteria for the other constituents that are the subject of these revised draft TMDLs is sufficient to attain the narrative criteria for Class C and D waterways. The Clean Water Act requires the District to "satisfy each independent criterion the District established, whether narrative or numeric." The District cannot assume its way to compliance with the Act.

Response: See the response to Comment #45.

111. The commenters state that DOEE fails to even acknowledge most of the applicable narrative criteria. The commenters go on to suggest that the revised draft TMDLs suffer from a more fundamental flaw: they entirely ignore the other five applicable narrative criteria. In addition, within this comment the commenters provide an excerpt of the District's water quality standards:

> The surface waters of the District shall be free from substances in amounts or combinations that do any one of the following:
>
> (a) Settle to form objectionable deposits;
> (b) Float as debris, scum, oil, or other matter to create a nuisance;
> (c) Produce objectionable odor, color, taste, or turbidity;
> (d) Cause injury to, are toxic to, or produce adverse physiological or behavioral changes in humans, plants, or animals;
> (e) Produce undesirable or nuisance aquatic life or result in the dominance of nuisance species; or
> (f) Impair the biological community that naturally occurs in the waters or depends upon the waters for its survival and propagation.

Nowhere in the revised draft TMDLs does DOEE analyze or discuss how attainment of the numeric limits will lead to the attainment and maintenance of these narrative criteria, other than criterion (d).

Response: See Response Essay #10.

112. The commenters state that many of the other narrative criteria are particularly applicable to the toxic pollutants at issue here. For example, the revised draft TMDLs state that organochlorine pesticides have "strong adherence to soils or sediments" and a "strong tendency to bioaccumulate in fish, plants, and animals." The revised draft TMDLs further explain that "[o]rganochlorine pesticides can have a wide variety of harmful acute and chronic effects on aquatic organisms, including neurological damage and endocrine disorders, and humans, including causing illness and cancer." The commenters also state that as for PAHs, the revised draft TMDLs state that they also tend to adhere to soils and sediments and accumulate in aquatic organisms, and that the concentration of PAHs in aquatic plants and animals is higher than in surrounding waters. These descriptions of the nature of these toxic pollutants and the harms they cause to aquatic plants, animals, and humans, at a minimum indicates that they "[s]ettle to form objectionable deposits" and "[i]mpair the biological community that naturally occurs in the waters or depends upon the waters for its survival and propagation." The commenters state that in choosing to focus solely on criterion (d), DOEE either failed to study and present analysis on how the numeric limits are sufficient to attain all six criteria, or purposefully chose to ignore the effects of the revised draft TMDLs on criteria other than (d). Either of these is a fatal flaw that undermines the validity of the TMDLs, as DOEE presents "'no findings and no analysis' to justify a conclusion" that the TMDLs "would satisfy all applicable water quality standards."

Response: See Response Essay #10.

113. The commenters state that the revised draft TMDLs do not demonstrate protection of all existing and designated uses. In its discussion of the designated uses and applicable water quality standards, DOEE recognizes that the Anacostia is designated for uses including primary contact recreation; secondary contact recreation and aesthetic enjoyment; protection and propagation of fish, shellfish, and wildlife; and protection of human health related to consumption of fish and shellfish. DOEE states that the District has adopted EPA's Human Health Ambient water quality criteria ("WQC"), which "represent the latest scientific information and policies that consider the amounts at which pollutants are toxic to humans." The agency further states that because EPA's WQC "are the most stringent WQC in the District's WQS regulations, attainment of these criteria will . . . attain and maintain the applicable narrative criteria." In making this broad and erroneous statement, DOEE ignores that the water quality criteria for the constituents subject to these draft TMDLs apply only to the protection of Class C and D waterway uses—protection and propagation of fish, shellfish, and wildlife; and protection of human health related to consumption of fish and shellfish. They are not tied to the protection of primary or secondary contact recreation. DOEE's invocation of the term "most stringent criteria" is meaningless, because "attainment of [those] water quality criteri[a] is unrelated to recreational or aesthetic uses and thus says nothing about the protection of such uses."

Response: See Response Essay #10.

114. The commenters state that nothing in the record shows that DOEE looked into whether the revised draft TMDLs' numeric criteria protect recreational and aesthetic uses in the District's waterways. And while it might be more convenient for DOEE to continue asserting, rulemaking after rulemaking, that primary contact recreational uses do not currently take place on the Anacostia, the "illusory truth effect" has no purchase on the many community members that regularly recreate in, on, or along the river. The truth is that the Anacostia is widely used for all forms of recreative activities. Not only do District residents regularly swim and paddleboard in the Anacostia despite existing swimming prohibitions, but DOEE itself issues approvals for swim events in the Anacostia. That DOEE would choose not to recognize primary contact recreation as a current use of the Anacostia River is astonishing. Under EPA's antidegradation rules, the District is required to protect existing uses.

Response: See Response Essay #10.

115. The commenters suggest that DOEE chooses to erroneously omit Class A uses as existing uses in the Anacostia, however, does not change the fact that the entire river is designated for Class A and B uses. In addition to having to issue water quality standards that protect primary contact recreation in the Anacostia River, DOEE's TMDLs must protect the many secondary contact recreation activities that happen on and near the river. The Anacostia Community Boathouse Association, for example, schedules hundreds of rowing and paddling events each month during the season. Further, hundreds of thousands of people regularly recreate every year along the shores of the Anacostia, partaking in activities that fall under Class B uses. In fact, the COVID-19 pandemic attracted many more people to the river's shores—in Kingman and Heritage islands, visitors increased by over 40% between 2019 and 2020. DOEE's failure to provide for the

protection of the many people that engage in these uses renders the revised draft TMDLs legally, practically, and morally insufficient.

Response: See Response Essay #10.

116. The commenters write that the revised draft TMDLs still fail to provide an adequate margin of safety ("MOS"). In the 2003 Anacostia TMDLs for organics and metals, an explicit 1% margin of safety was applied. But in these revised draft TMDLs, this explicit MOS was removed and replaced with an "implicit" MOS, without explanation for the change. Implicit MOSs rely on conservative modeling assumptions to account for uncertainty in the TMDLs, instead of applying a percentage of the loads as the MOS. Furthermore, the margin of safety in the revised draft TMDLs does not take into account any lack of knowledge concerning the relationship between effluent limitations and water quality. This analysis must be explicitly included in the final TMDLs in order to comply with this statutory requirement.

Response: See Response Essay #11.

117. Further, the commenters state that some of the conservative assumptions identified in these revised draft TMDLs are not truly conservative, and there are many non-conservative assumptions in the TMDLs, rending this implicit MOS insufficient. For example, the use of the years 2014 – 2017 is not a conservative approach to the years used for modeling because this selection fails to take into account the significant increases in precipitation the DC region is experiencing due to climate change and include two unusually drier years (2016 – 2017). Rainfall in 2018 was approximately double the amounts in 2016 and 2017, and approximately a third greater than the amounts in 2014 and 2015. The 2020 rainfall amount was nearly a quarter greater than the amounts in 2014 and 2015, and close to 50% greater than the amounts in 2016 and 2017. And while rainfall in 2021 and 2022 were less than their immediate preceding years, the longterm trend still points to a dramatic increase in rainfall levels that is not reflected in the 2014 – 2017 year selection.

Response: See Response Essays #11 and #12.

118. The commenters go on to state that in light of DOEE's lack of data, the agency's assumption that permitted point sources are discharging toxic pollutants at criteria levels would only be a conservative approach if these facilities are actually currently discharging toxic pollutants at levels above criteria concentrations. If these facilities are instead discharging at levels below criteria concentrations, this assumption could allow these sources to increase their toxic pollutant discharges. Or if the facilities are indeed currently discharging at criteria concentrations, this assumption would be neither conservative nor liberal.

Response: See Response Essay #3.

119. The commenters state that setting non-detect results in the water quality monitoring data at half the detection limits is not necessarily a conservative assumption, and additional information is needed in order to determine whether this is a conservative approach. Whether setting the

non-detect samples at half the detection limits is conservative depends on the type of detection limits that were used, the quantification or reporting limits that were used, and whether the "detection limit" referenced in the draft is actually a "quantification limit." While setting the non-detect samples at half of the quantification limits might be conservative, setting the samples at half of the detection limits is likely not conservative. The revised draft TMDLs should provide this information in order to clarify whether setting the non-detects at half the detection limits is a conservative assumption.

Response: See Response Essay #11.

120. The commenters suggest that the draft TMDLs contain numerous other non-conservative assumptions that vitiate the claims that the modeling is conservative. For example, the revised draft TMDLs do not include sufficient monitoring to ensure progress towards implementation, including monitoring to assess whether and to what extent natural attenuation of sediment contamination is occurring. Lastly, the model relies on reductions that do not appear to be realistic, with some sources requiring a 90-100% reduction, whereas other sources are expected to have no reductions. As a result of these critical flaws and non-conservative modeling assumptions, the revised draft TMDLs cannot logically claim to contain an implicit MOS based on conservative assumptions.

Response: The comment appears to conflate the concept of conservative assumptions as used in connection with margin of safety and with consideration of whether certain voluntary or nonvoluntary measures provide reasonable assurance. See Response Essays #8, #9, and # 11.

121. The commenters state that the revised draft TMDLs still fail to consider environmental justice. DOEE's failure to consider how cumulative environmental impacts affect the communities living along the Anacostia, including those impacts linked to primary and secondary recreational uses, as well as due to consumption of fish and shellfish from the river, severely weakens the validity of the revised draft TMDLs.

Response: See Response Essay #13. See also Response Essay #10.

122. The commenters state that The Washington D.C. area has the greatest income inequality level in the United States. The District's food insecurity rates, which long have been among the highest in the county, have continued to rise during the COVID-19 pandemic. Subsistence fishing along the Anacostia, practiced by many of the District's Black residents for many generations, continues to be one of the community's ways to combat food insecurity. It is estimated that at least 17,000 people in the lower Anacostia eat fish from the river every year. Fish harvested from the Anacostia is not only consumed by the anglers who catch them and their families. Instead, studies show that there is a "widespread sharing of fish in extended social networks." For many of these individuals, signage about fish consumption risks is not likely to change their reliance on subsistence fishing as a means of putting food on the table. Thus, DOEE's decision to set water quality criteria for the Anacostia based on exposure factors, such as the fish consumption rate, that do not reflect the actual frequency of fish consumption by communities

along the Anacostia, understates the extent of exposure to these metals and toxics in the community.

Response: See Response Essay #13.

123. The commenters write that by ignoring the existing cumulative impact of these pollutants—particularly those that have the potential to bioaccumulate—on the health of the communities that have long consumed fish from the Anacostia, the revised draft TMDLs fail to protect human health.

Response: See Response Essay #13.

124. The revised draft TMDLs not only fail to analyze the cumulative environmental impacts suffered by communities that rely on the Anacostia as a food source, but they also guarantee that health impacts will continue to worsen. According to Table 5-1, natural attenuation for most constituents at issue in these revised draft TMDLs will not occur for many decades—in some cases, hundreds of years. DOEE's inexplicable decision to sit idly while time runs its course will only compound the injustices suffered by Black communities that engage in subsistence fishing on the Anacostia.

Response: See Response Essay #13. With respect to the commenter's assertion that DOEE is "sitting idly by," DOEE disagrees. See Response Essays #1, #2, and #7. DOEE notes that, in the case of these TMDL pollutants, much of the impairment is due the legacy presence of the TMDL pollutants on land and in the river system, rather than through generation and discharge of these pollutants as a result of present, active operations. The legacy nature of much of the impairment, combined with the nature of the TMDL pollutants, means that return to water quality standards necessarily will take a long period of time. The majority of allocations in these TMDLs are within the 97% to 100% range.

125. The commenters state that at their request DOEE, through its consultant Tetra Tech, performed a climate change analysis alongside its most recent TMDL update. After doing so, DOEE reached the conclusion that "climate change is not predicted to have a significant enough impact on water quality following achievement of the TMDL allocations to warrant revisions to the TMDL allocations." While Commenters appreciate DOEE's efforts to center climate change concerns by modeling future impacts related to the TMDLs, Commenters observe a few important omissions from DOEE's model inputs and assumptions that call into question DOEE's ultimate conclusion of no "significant … impact." The commenters state that relevant climate change factors not considered by DOEE's model may contribute to higher loads of toxic contaminants in the Anacostia watershed than modeled. DOEE's climate change analysis limited itself to projections of precipitation quantity and intensity, air temperature, and sea level rise, which were sourced from datasets generated by the Chesapeake Bay Modeling Workgroup. These three factors were chosen to align with a larger regional modeling effort. However, climate change has and will have broader, cascading effects not captured by the three selected factors that stand to affect water quality.

Response: See Response Essay #14.

126. The commenters explain that one factor not considered is the impact of climate change on species that help filter the region's waters. Submerged aquatic vegetation (SAV) grows in the shallow region of the Chesapeake Bay and its rivers and is essential for, among other functions, filtering polluted runoff and is "of utmost ecological importance in a watershed system." However, climate change has contributed to a precipitous decline in grass beds since the 1950s, including in the Anacostia River. In 2017, the District had a high of 1,176.15 acres of SAV in its surface waters. By 2021, total SAV acreage had declined precipitously to a total of 6.9 acres, all in the Anacostia River—a mere 1/20th of a single percent of the area it covered four years previously. A major factor in the dramatic decline of SAV in the Anacostia River starting in 2018 was "record-breaking precipitation." DOEE in its analysis finds that the region will experience "increased precipitation" resulting from climate change. While framed as a positive for TMDL attainment because increased volume in the river will dilute contaminant concentrations, that same increased precipitation is deadly for SAV. It stands to reason that continued climate change will continue to deplete SAV, even if it occasionally recovers, reducing the amount of pollution that is taken up by vegetation and increasing the amount of pollution in the water. The decline of SAV is a factor that is not accounted for in the climate change analysis but could have real effects on whether the Anacostia watershed attains the TMDL endpoints.

Response: See Response Essay #14.

127. The commenters continue that another important impact of climate change that DOEE does not seem to contemplate is increased erosion of riverbanks and resulting sedimentation caused by increasing and heavier precipitation from severe weather events strengthened by climate change. The District is vulnerable to climate change-intensified coastal storms, such as hurricanes. According to EPA, "[c]limate changes, such as more frequent and intense rain events, can increase erosion and result in greater amounts of sediment washing into rivers, lakes and streams." Contaminants, such as TMDL pollutants DDT and chlordane, adhere to sediment rather than dissolving into water. Increased sedimentation, for example from Kenilworth Park Landfill, caused by erosion may increase levels of TMDL-regulated toxic pollutants washing into the Anacostia River due to climate change, yet this eventuality is not accounted for in DOEE's analysis.

Response: See Response Essay #14.

128. The commenters state that similar to SAV, mussels also provide important filtration services by removing sediment and other contaminants from watershed waters at a rate of between 10 to 20 gallons of water per day for an adult. Mussels' filtering prowess helps improve water clarity, which leads to good conditions for SAV to grow. Mussels thrive best in "stable" waterways, or waterways that do not experience flashes of heavy input from stormwater runoff during storms. Kingman Lake, an off-channel wetland to the Anacostia River, and Buzzard Point, where the Anacostia mixes with the Potomac, in particular function as important sanctuaries for mussels. Furthermore, many species are highly sensitive to temperature and cannot thrive in water that is too warm. In describing the results of its climate change assessment, DOEE states that, even though climate change can be expected to increase the amount of toxic pollutants making it into

the Anacostia River, “due to increased precipitation and associated runoff, the dilution of these toxics due to sea level rise and other hydrologic functions counteracts the increased load and results in minimal impact from climate change under the TMDL scenario.” The factors named here—increased precipitation and associated runoff—could likely be expected to sporadically increase turbidity and volume of receiving waters, impacting mussels. Of the eight mussels species found in the Anacostia, five are listed as Species of Greatest Conservation Need by the U.S. Geological Survey, indicating they are in danger due in part to climate change. Efforts have been underway for the past five years to restore Anacostia River mussel populations, and monitored species have shown shell growth and population increases. Work is still in progress to understand exactly how much pollution mussels filter out of the Anacostia River. Altogether, higher water temperatures, increased precipitation, and increased runoff will result from continuing climate change, and all three factors reduce mussels’ ability to filter contaminants out of the Anacostia River.

Response: See Response Essay #14.

129. The commenters conclude that DOEE’s climate change analysis is overly simplistic and omits a number of important factors such as the impact of climate change on species such as mussels and SAV that filter out water contaminants, and increased erosion from severe weather events causing influxes of sediment into the Anacostia River. These climate change-exacerbated impacts will increase the amount of contaminants in the Anacostia watershed and are not even summarily accounted for in DOEE’s analysis. With its overly simple model and conclusion that “climate change is not predicted to have a significant enough impact on water quality … to warrant revisions to the TMDL allocations,” DOEE mostly checks a procedural box without fully considering potential downstream impacts. Commenters urge DOEE to revise its model to take into account a broader range of climate change impacts that can be expected to increase contaminants into the Anacostia watershed, and to adjust the revised draft TMDLs accordingly.

Response: See Response Essay #14.

130. The commenters state that these revised draft TMDLs still rely on a number of planned actions that should reduce toxic pollutant levels in the Anacostia over time. But the success of these TMDLs will depend, in part, on when (and whether) these planned-for pollution reducing activities occur, as well as whether they have the desired effects. In order for the public to meaningfully track the implementation of these TMDLs, DOEE must include a monitoring and implementation schedule that clearly states the agency’s expectations on timing for progress on the river.

Response: See Response Essay #8.

131. The commenters state that without a clear monitoring and implementation schedule, there is no way for the public to track DOEE’s progress and its efforts to monitor the health of the river. For example, DOEE states in this draft that it commits to “post-TMDL monitoring.” While this is an improvement from previous drafts, as discussed above, it is unclear what monitoring data the agency has already received, how it plans to use this data, and when it plans to collect more

data. Merely stating that it will monitor for pollutants in fish tissue every 2-3 years does not give the public assurance that these TMDLs will meet their regulatory requirements. The commenters request that request that DOEE's final TMDLs include a clear compliance monitoring schedule and an implementation plan with both water column and sediment monitoring requirements. Further, because a key goal of these TMDLs is to ensure that the Anacostia supports safe consumption of fish, the TMDLs must require periodic fish tissue monitoring.

Response: See Response Essay #8.

132. The commenters expand on the previous comment and state that the revised draft TMDLs greatly rely on natural attenuation as the method by which TMDL endpoints will be met. Because the TMDLs rely on hoped-for natural reductions in pollutant levels over time, it is especially important that the TMDLs include a sediment monitoring plan that will inform stakeholders whether the TMDLs are resulting in adequate progress toward the TMDL endpoints. Sediment sampling should occur no less than once per year. Sampling should be conducted at fixed sampling sites, with samples tested for all constituents of concern in these TMDLs.

Response: See Response Essays #6 and #8.

133. The commenters continue that whether natural attenuation of sediment pollution will occur depends on whether TMDL implementation leads to a net reduction in toxic pollutant concentrations in the water column. Further, ensuring water column pollution reductions is necessary to protect human health and aquatic life. In-stream water column monitoring must therefore be a part of the implementation monitoring plan. The TMDL monitoring plan should call for quarterly in-stream water column sampling that measures water column toxicity and metals, as well as general water quality constituents. Quarterly water column sampling should occur at fixed sites in each segment and should continue until numeric targets are consistently met.

Response: See Response Essays #6 and #9.

134. The commenters describe that the revised draft TMDLs are correct in highlighting the need for fish tissue sampling considering the strong culture of subsistence fishing along the lower Anacostia and the impaired waters' inability to support those beneficial uses. However, conducting fish tissue sampling every two to three years insufficiently contends with the impacts that consumption of contaminated fish have on subsistence anglers and their communities, and is not a reliable plan by which to measure the TMDLs' impacts on fish toxicity. The TMDLs must require at least annual fish tissue sampling and ensure that funding is available to conduct sampling. The sampling protocols should require sampling of fish species and sizes normally consumed by anglers in the lower Anacostia. Sampling should be carried out no less often than every year, and timing and location of sampling should be consistent (e.g., depending on the life cycle of the species selected, after breeding season and a full summer of potential exposure to toxics and metals has occurred).

Response: See the response to Comment #106 and Response Essay #8.

135. The commenters state that any TMDLs that contemplate future nonpoint source reductions must include (1) reasonable assurances that nonpoint source controls will be implemented and maintained, and (2) an effectiveness monitoring plan that demonstrates nonpoint source reductions.

Response: See Response Essay #8.

136. The commenters state that the revised draft TMDLs rely on future remediation of legacy pollution sites as a source of nonpoint source reductions. However, the revised draft TMDLs do not provide for any monitoring of pollution from these legacy sites prior to remediation, or after remediation to confirm the effectiveness of the remediation efforts. As such, the TMDLs must provide for monitoring of nonpoint source discharges during storm events to measure the effectiveness of BMPs and site remediation efforts in reducing nonpoint source discharges.

Response: See Response Essay #8.

137. The commenters state that the monitoring plan should be designed to provide pre-implementation baseline conditions. Establishing pre-implementation baselines is indispensable if post-implementation monitoring data are to be compared for effectiveness tracking. Baselines should also be defined relative to flow, as implementation monitoring data may not be comparable if baselines were established at base flow and post-implementation monitoring data is collected during high flow circumstances.

Response: See Response Essay #8.

138. Monitoring sites should be carefully chosen to isolate important areas of treatment along the watershed. For example, non-point source monitoring sites must include, at a minimum, legacy contaminated sites that DOEE expects will result in reductions of toxic pollutant loads upon remediation efforts. Monitoring sites to assess overall progress of TMDL implementation should also be selected to ensure that progress toward achieving water quality standards in each impaired section and tributary within the watershed. Having monitoring data from each impaired segment and tributary is necessary to allow DOEE to determine if and where load allocations need to be revised to achieve the water quality standards.

Response: See Response Essay #8.

139. The commenters state that in order to ensure that it is meeting its regulatory obligations, DOEE must include a TMDL implantation schedule in the final TMDLs. The implementation schedule should include explicit timeframes for assessment of progress and reassessment of loads as needed, in order to ensure that adaptive management actually occurs.

Response: See the response to Comment #35 and Response Essay #8.

140. Related to the previous comment, the commenters provide a TMDL example that includes an implementation schedule: the Calleguas Creek Watershed Metals and Selenium TMDL. The commenters also reference multiple Virginia TMDLs which incorporate an iterative process that emphasizes beginning with "those sources with the largest impact on water quality." In these TMDLs, Virginia established a staged implementation program that begins with a pre-defined set of point-source pollution reductions. Critically, these implementation sections outline a process that provides the public with a benchmark to measure the success of these TMDLs.

Response: See Response Essay #8.

141. The commenters state that although the revised draft TMDLs identify several legacy contaminated sites that, once remediated, will result in reductions of nonpoint source toxic pollutant loads, they do not propose a timeline for the implementation of these remediation efforts. Because the revised draft TMDLs heavily rely on natural attenuation for water quality standards attainment, the timing of these remediation efforts will be key to achieving water quality standards within the timeframes indicated in the TMDLs. The TMDLs must include an implementation schedule for legacy site remediation projects, including implementation milestones.

Response: See Response Essays #6 and #8.

142. The commenters state that these TMDLs will be established as a snapshot in time, relying on previous monitoring data and many layers of assumptions and modeling. Because watershed conditions are not static, however, achievement of the TMDLs endpoints will depend on the DOEE's ability to review the TMDLs based on feedback obtained from monitoring efforts. As such, the TMDLs should include an adaptive management procedure for reviewing progress on implementation milestones and for reviewing BMPs, WLAs, and LAs, as necessary, to meet the TMDLs target loads. The commenters suggest that the TMDLs' adaptive management plan should allow DOEE to adjust implementation strategies, originally established based on modeled predictions, as required by actual observations. For example, if remediation of legacy pollution sites does not occur until later than expected, thus leading to more nonpoint source discharges into the watershed, the TMDL endpoints will likely not be achieved as expected under the TMDLs. Adaptive management would thus require DOEE to reassess whether changes to the BMPs, WLAs, or LAs are necessary to maintain forward progress.

Response: See Response Essay #8.

143. The commenters continue that the TMDLs' adaptive management plan should contain four primary components:

Specifying and describing what monitoring method(s) is/are being used. Listing and describing what quantitative management triggers are being established.
Indicating what the timeframe for decision making is.
Documenting what the potential management actions and options are.

And as explained above, the plan's implementation schedule should provide for explicit time periods when monitoring results are reviewed and overall TMDL progress is assessed under this framework.

Response: See Response Essay #8.

144. The Anacostia and its aquatic biota, and all of the humans who use the river, have suffered from high levels of toxic pollution for far too long. The revised draft TMDLs fall far short of legal requirements and will not ensure compliance with water quality standards. For the reasons detailed above, we request that DOEE address the problems identified in these comments, and recirculate new draft TMDLs for comment before finalizing new organics and metals TMDLs for the Anacostia watershed.

Response: See Response Essay #1.

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